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Pavements and Roads.

THE book published under this title* contains the results of a special inquiry into the subject set on foot by the New York technical journal named on the title-page, and which has apparently been induced by special circumstances to enter with remarkable earnestness on the collection of statistics in regard to pavements and roads. Those who may have been in New York a few years since can probably endorse the view we advance, and the opinion of most people, viz., that for its size and importance, it was the most disreputably paved city in the civilised world. A very large sum (3,000,000 dols.) has, however, been voted to place it more on a par with other places, and the subject has consequently become one of exceptional interest there as well as in other American cities. In the course of its search for special knowledge, the *Engineering and Building Record* of New York has amassed a large amount of evidence from many quarters; and, without expressing any very particular opinions, or indicating any sort of bias, it has been good enough to compile everything which it has obtained relating to the subject which was likely to be of practical utility into a volume of over 400 pages, bringing it quite up to date in these matters. It also instituted a competition, with prizes of 15*l.*, 10*l.*, and 5*l.*, for essays on the subject, and received as many as twenty-one, three of which have been published, in a more or less condensed form, in the volume; extracts have also been made from several of the others where a point of value happened to have been introduced. We have had to rely so long in England on Clark and Law's work as the standard authority on roads and streets, in which several of the chapters, which should be most important, were written so long ago as to be now obsolete, that we have the less hesitation about treating at some length the consideration of the work now under review.

The first part of the work more especially relates to streets, and comprises chapters on stone, wood, asphalte, and brick pavements,—firstly, for the carriage-ways, and, secondly, for the footways; the first cost, the cost of maintenance, and specifications of each kind are noted and commented on. The second part is devoted entirely to roads, and the third part to the above-mentioned essays. England, France, and Germany are chiefly taxed for the information comprised in the work, but the experiences of the Department of Public Works in India are occasionally alluded to, and, in fact, one of the essays is by a gentleman who was employed in that Department for many years. The book commences with a valuable memorandum from Mr. Clement Dunscombe, detailing the work in Liverpool streets, more particularly with respect to stone. With regard to the foundations for paving first-class streets in that city, the concrete is made in an exceptional manner, as follows:—

"The ground having been excavated, thoroughly consolidated, and properly graded to the requisite depth and shape, a layer of broken stone (or other material) is spread evenly over the surface, and thoroughly wetted from the rose of a watering-can. A stratum of mortar (1 part by measure of cement to 5 or 6 parts gravel, thoroughly mixed dry, and only enough water then allowed to flow on it to make the material damp enough after it is incorporated to retain its form when a portion is taken in the hand and pressed) is spread over this, and a second layer of stone added. The stone is then beaten in with a heavy flat beater. Other layers of mortar and stone are added, and thoroughly beaten in until the required thickness is obtained, the final layer of cement mortar (to complete the full specified thickness of 6 in.) being smoothed off to an even and uniform surface."

The quantity of broken stone is equal to that of the cement and gravel, and has to pass through a 2½-in. ring in every direction, and be clean and free from foreign matter. The gravel has also to be clean, and excludes all stone which will not pass a 1-in. ring, but includes sand. The cement must not leave more than 10 per cent. residuum on a No. 50 wire sieve, and give a tensile strength of 400 lbs. per square inch after seven days immersion. The concrete must set for ten days before paving is begun upon it. Mr. Dunscombe attached a high value to the accurate gauging of setts, considering that if the gauging was done at the quarries, even though the cost might be thereby increased to the extent of 1s. 6d. per ton, a considerable eventual saving resulted, as the width of the joints of the sets cannot be too small. He believed that wide joints were on many grounds open to objection, and that where these joints are grouted in lime or cement instead of pitch and creosote oil, they often become receptacles for all filth. He considered that it was a mistaken notion to suppose that the width of the joints made the pavement in any way safer, as it was the inequalities of the sets which gave sufficient foothold.

The Liverpool traffic is very considerable, and it is interesting to compare it by the rule frequently accepted (of tons per yard width of carriage-way per diem) with that of certain London streets, which are given further on in the work, on information chiefly obtained from a paper written by Mr. Howarth, M.I.C.E.:—

		Tons.
Liverpool...	Bath-street and New Quay .	1,150
London.....	Parliament-street	1,106
,, ...	Oxford-street (average)	1,085
Liverpool...	Great Howard-street	961
London.....	Leadenhall-street (average).	904
Liverpool...	North John-street	692
London.....	Brompton-road	648
Liverpool...	Lord and Church streets (average)	458
London.....	Regent-street	558
,, ...	King's-road (average).....	500

The stone paving in Liverpool is executed entirely by Corporation workmen, and with the most durable stone procurable, and, as an instance of the economy which results from the adoption and retention of this principle, it is stated that setts taken up in North John-street (above mentioned) after fourteen years' wear showed no measurable amount of wear.

The setts for the various classes of streets vary as follows:—

	L.	B.	D.
For first-class streets ...	3¼″ ×	3¼″	× 6¼″
Ditto with exceptionally heavy traffic	3¾″ ×	3¾″	× 7¼″
Second class	4″ ×	4″	× 4″
	or 3″ ×	5″ (to 7″)	× 6½″
	or 3″ ×	5″ (to 7″)	× 5″
Third-class	4″ ×	4″	× 4″

One-quarter of an inch in deviation is allowed in these dimensions. The joints of the setts are filled with hard, clean, dry, fine shingle, and the setts rammed until the joints are full, when they are run with a hot mixture of coal-pitch and creosote oil, and the whole covered with half an inch of sharp gravel. The original cost is as follows:—

First class, per superficial yard...	13s. 6d.
Second ,, ,, ,,	9s. 9d.
Third ,, ,, ,,	8s. 4d.

This includes concrete foundations, &c.;

* "Pavements and Roads." Reprinted from the *Engineering and Building Record*, New York.

but it is doubtful whether it includes establishment charges, and there is, of course, no contractor's profit to reckon for.

To this valuable contribution are attached a series of excellent sections illustrating the different classes of street-pavings of Liverpool.

Now, in connection with the re-paving of New York under the three-million-dollar vote, it was specified by the Special Commissioner that 1-in. joints would be permitted, and he went so far as to say that although from 8 in. to 12 in. was specified for the length, they might be as much as 25 in. in length without harm. For this opinion he was very properly taken to task by the *Engineering and Building Record*, who "regretted that so competent an executive officer should so far forget himself as to talk on a subject on which he cannot be expected to be an expert (and evidently has a great deal to learn), and announce the dangerous doctrine that the department's specifications are not expected to be enforced." Other persons lashed out in the press on the same subject, and it is evident that the public eye was wide awake and intelligently watched the execution of this important work.

Cincinnati followed suit with a vote of 2,000,000 dols. (part for stone and partly for asphalte pavement), and other American cities for large amounts. Topeka, Kansas State, determined to use a large quantity of Sioux Falls stone, which, after a long wrangle there and elsewhere, was determined to be called granite. It is in reality a quartzite, and far more nearly allied to sandstone (though much tougher) than it is to granite, but it is not surprising to hear of its being spoken of as "granite," which often seems to be taken to mean anything except common stone. Amongst the many published comparisons on this work between various kinds of pavements for streets, is one by Mr. P. Rice, City Civil Engineer of Cleveland, Ohio, between asphalte and stone, and he sums it up as follows:—"In discussing sheet pavements, *i.e.*, asphalte, a standard of comparisons might be outlined as follows:—First, moderate cost; second, durability; third, resistance; fourth, secure foothold for horses; fifth, healthfulness; sixth, noiselessness." With due deference to Mr. Rice, such order of importance must vary in accordance with the nature of a street, the fifth and sixth items, and especially the sixth, having frequently primary importance. However, he continues as follows: — "First, sheet pavements do not satisfy the first requirement much better than dressed block; second, I should give dressed block the preference as regards durability and ultimate cost; third, the resistance to traction is undoubtedly less on sheet pavements; fourth, such few experiments as have been made indicate fewer accidents to horses on sheet pavements than on granite, but do not think it would hold good for medina (a hard sandstone); fifth, both sheet pavements and dressed blocks are healthy, and the asphalte filling of the latter fulfils all sanitary requirements; sixth, sheet pavements, perhaps, fulfil the last requirement better than stone, but there is the sharp click and ring of the horse's foot, although the vehicle itself makes little noise. In making repairs in the case of a stone pavement 50 to 75 per cent. of the old material can be used over again, but in the case of a sheet pavement it is worthless." Finally, he advised against laying asphalte pavements in any of the thoroughfares of Cleveland.

Mr. Rice was soon taken up by the asphalte men, one of whom, Mr. E. P. North, of New York, said that putting first cost and durability first was equivalent to a man "dressing himself in flannel shirt and stagey boots." He argued that noiselessness and minimum resistance to traction were closely associated with healthfulness in pavements, for the nearest approach to a perfect pavement, in a sanitary view, seemed accomplished by a pavement which was impervious to fluids, presented no inequalities in which solid and fluid fæcal or other matter can lodge, and admitted of cheap and thorough cleaning. He said that "there was another point which should not be overlooked: horses, besides doing more work, last longer, and there is less expense in repairing running gear and harness on such pavements than on any other."

The same gentleman drew a pleasing picture of the condition of the streets of some American cities as follows:—

"In New York, which may be regarded as the capital city of this country, one sighs for the quiet and repose of an active boiler-shop when the garbage carts of the city pass through its best residence streets; and Philadelphia, the home of our oldest and stateliest families, has 'pavements fringed with murderous stones.' And in most of our cities one can count, in the words of Coleridge, 'two-and-seventy stenches, all well-defined and genuine stinks,' any pleasant summer day."

He however excepted Washington and Buffalo.

Whilst on the subject of stone paving, we notice some well-selected extracts from the periodical statistical reports of Colonel Haywood. From them we gather that the average annual cost (entire) of granite paving in the City for about thirty-three years back has been 9¾d. per square yard, as against 2s. 0½d. for wood. This includes cost of construction plus cost of maintenance, the duration of granite being taken at twenty-five years and of wood about seven years. On London Bridge, with its enormous traffic, granite lasted twelve years, the wear in that time being 2 in., and the cost 2s. 3d. per square yard per annum. In the Poultry the wear on granite was 1½ in. in six years. (Nature of granite not stated, though a matter of very considerable importance.)

There is a gentleman whose writings are frequently quoted throughout this work, who appears to have made paving and road work a special study, and who is apparently an indefatigable collector of statistical information on the subject,—a certain Captain F. V. Greene, of the United States Corps of Engineers. This writer briefly states that,—

"The average life of granite blocks under heavy traffic in London is fifteen years, during which time the wear is about 2 in., when the edges become so rounded that the pavement is as rough as cobble stones. They can then be taken up, redressed, and laid on streets of lighter traffic, when they will last for twenty years more, during which time the wear is another 2 in. The blocks are then so worn that they have not a sufficient depth for a pavement surface, but can be sent to the crusher and broken up for concrete."

There is very little doubt that the damage to vehicles and the increase to traction demand a re-dressing of granite blocks more frequently than is customary, but workmanship on granite is so expensive that the operation is put off as long as possible, until, in fact, the paving is (as described by Captain Greene) similar to cobble stones, and its reputation seriously damaged. In St. Louis some experiments on the durability of street materials were made a few years ago by rolling a two-wheeled cart backwards and forwards over two strips of the pavement under test, each of which were 22 in. wide. The tires were each 2½ in. wide, and loaded up to 800 lb. per inch, or nearly 2 tons total weight. The samples were weighed before and after testing, and after a test equal to 8½ years traffic, the granite blocks had worn scarcely appreciably, while limestone had lost 10 per cent., asphalte blocks 14 per cent., and fire-brick 9 per cent. of their thickness, many of the latter being broken.

Comparisons of other kinds between various classes of paving will be treated on at the close of this article, but we will now turn to what is recorded in this volume about wood pavements. The subject is commenced by reprinting entirely the paper which was read by Mr. G. H. Stayton in 1884 before our Institution of Civil Engineers, together with the discussion which took place thereon. From this valuable paper it appears that there were at that time in London no less than 1,718 miles of streets in the charge of various authorities (in addition to 248 miles not yet taken over), giving a total of nearly 2,000 miles, and that they were covered in the following manner:—

Asphalte	13½	miles.
Wood	53	,,
Granite	280	,,
Macadam	573	,,
Flints or gravel	798½	,,
	1,718	

and that 40,000 vehicles and 100,000 horses were employed. The author very pointedly remarked that as the estimated value of the vehicles, horses, and their harness was about 5,000,000*l.*, the wear and tear, *i.e.* annual loss, must depend largely on the condition of the carriage ways. This is a point often alluded to, but scarcely appreciated, or indeed capable of being estimated, until we find ourselves in the presence of such a large figure as five millions sterling. Now, in tractive power alone, we find (by reference to Captain Greene's observations published in this work) that the various experiments made by Morin, MacNeil, Romford, Gordon, and others, give the following results:—

10 lbs. of tractive force are required to draw 1 ton on level ground on iron.
15 ,, of tractive force are required to draw 1 ton on level ground on asphalt.
21 ,, of tractive force are required to draw 1 ton on level ground on wood.
33 ,, of tractive force are required to draw 1 ton on level ground on best stone blocks.
50 ,, of tractive force are required to draw 1 ton on level ground on inferior stone blocks.
90 ,, of tractive force are required to draw 1 ton on level ground on average cobble stones.
100 ,, of tractive force are required to draw 1 ton on level ground on macadam.
200 ,, of tractive force are required to draw 1 ton on level ground on earth.

It is a singular commentary that in comparing this table with that of the mileage of the London streets we see that the largest proportion of street is paved with the material which requires the greatest exercise or waste of power on the part of the horses, and *vice versâ*. The same holds good, of course, of the strain on the harness. Taking the proportional value of the horses and harness in London at four millions, it may be estimated that if the gradients and other conditions were suitable for such a description of pavement the saving on horses, harness, and vehicles by using asphalte in place of any other material would, after allowing for the proportionally greater traffic on some of the streets paved with asphalte and wood over those paved with other materials, would be equal to about half a million sterling per annum, which would represent an approximate average of £300 per mile of street per annum in cost of maintenance! or, in other words, if the saving in transportation is proportional to the load carried, there would be a saving of the power of about 12,000 horses on the number now required for the London work. Captain Greene worked out similar details for New York, and reported that the transport in the streets of that city cost 22 cents per ton-mile, and that by railway $\frac{6}{10}$ of a cent per ton-mile, or as 1 to 36, a somewhat remarkable difference. But even discarding those cases in which, owing either to gradient or to other causes, it is not considered advisable to use the better classes of pavement, it is manifest that the great indirect saving in cost of traction must go far to counterbalance the increased cost (if any) of the maintenance of such pavements.

Mr. Stayton's paper on wood pavements, and the experience of Washington, U.S.A., tend to show the extreme importance of a good concrete foundation, the last-named city having founded their wood pavements so badly that after an expenditure of four million dollars, the wood as a pavement lasted so short a time that it was quite discredited, and has been very much, if not entirely, replaced by asphalte. In Chelsea the total cost of the wood pavement averaged 10s. 4½d. per yard. Many trials of various woods are recorded, and the blocks found most suitable were those cut from Swedish yellow deals (Gothenburg thirds); but the result of heavy traffic upon various kinds of wood unquestionably demonstrated that of

hard woods, pitch-pine takes a high place: the price, however, was considerably in advance of fir, and the irregular sizes of the deals created much difficulty. All work in Chelsea was executed by the workmen of the Vestry, the blocks being supplied by contract. Mr. Stayton urged that ample and competent supervision should be provided against the acceptance of unsound blocks. He said:—"The operation of inspecting each block is undoubtedly tedious: for example, in the Chelsea works, where the timber supplied was of fair quality, it was found necessary to separately sort out, reject, and mark about one block in twenty, the rejections being 96,000 out of a total delivery of nearly two millions; and there is little doubt that, owing to the hurry of the work, many blocks were laid which escaped rejection, but assuredly these will be the first to fail." Mr. Stayton's researches enabled him to produce some very instructive statistics on cost and on wear, which are well worthy of examination. From them we have prepared the annexed tables: (*a*) of first cost, (*b*) of relative wear, and (*c*) of proportional relative cost of the wood pavements in those streets in London which are recorded in the work under review:—

A.—COST OF WOOD PAVEMENTS IN LONDON STREETS.

By whom laid.	Place.	Cost per square yard.	Number of years guaranteed free of cost to Vestry.	Contract for maintenance per square yard per annum for x years.
		s. d.		s. d.
Asphaltic Wood Company	Oxford-street	13 6		1 2 for 15 yrs.
Ditto	Strand	13 6		1 0 for 12 yrs.
Ditto	Fleet-street	15 0		
Ditto	Regent-street	12 6		
Ditto	Brompton-road	13 9		
Henson's Wood Company	Oxford-street	16 6 (1)		1 0 for 15 yrs.
Ditto	Ditto	14 0 (1)		1 0 for 12 yrs.
Ditto	Ditto	16 6 (1)		
Ditto	Brompton-road	12 9	3	
Ditto	Fleet-street	16 0		1 7 for 19 yrs.
Ditto	Leadenhall-street	18 6	2	1 6 for 17 yrs.
Ditto	Euston-road	11 6	3	0 8 for 12 yrs.
Improved Wood Company	Ludgate-hill	18 0 (2)	1	1 6 for 15 yrs.
Ditto	Aldersgate-street	15 0	2	1 0 for 15 yrs.
Ditto	Northumberland-avenue	15 0		1 3 for 15 yrs.
Ditto	Leadenhall-street	12 3	2	1 0 for 15 yrs.
Ditto	Piccadilly	0 (3)		3 0 for 15 yrs. (3)
Ditto	Parliament-street	13 8		0 4 for 3 yrs.
Ditto	Oxford-street	16 0	2	1 0 for 13 yrs.
Mowlem & Co.	High-street, Kensington	14 0	3	
Ditto	Fulham-road	14 0		
Nowell & Robson	High-street, Nottinghill	12 6	3	
St. Marylebone Vestry	Oxford-street	8 4½ (1)		
Paddington Vestry (plain)	Praed-street	10 7		
Chelsea Vestry (plain)	King's-road	10 6		
Ditto (ditto)	Sloane-street	10 6		
Ditto (ditto)	Fulham-road	10 3		
Various other kinds in Chelsea	King's-road	11s. 8d. to 14s. 2d		

(1) On existing concrete foundations.
(2) On boards, since replaced.
(3) On the principle of deferred payments.

B—COMPARATIVE WEAR OF WOOD PAVEMENTS AS REDUCED TO A TRAFFIC STANDARD.

System]	Situation.	Weight per yard width per day of sixteen hours.	Depth of annual wear of wood.	Comparative annual wear of wood as reduced to a traffic standard of 750 tons per yard width per diem.
			Inch.	Inch.
Plain (pitch-pine)	King's-road	468	·055	·088
Improved	Parliament-street	1,106	·154	·104
Improved (pitch-pine)	King's-road	558	·089	·119
Henson's	Oxford-street (east)	1,191	·191	·120
Henson's	Fleet-street	1,165	·269	·173
Plain	Sloane-street	279	·065	·175
Improved	Leadenhall-street	808	·200	·186
Improved	King's-road	603	·157	·195
Plain	King's-road	551	·144	·196
Henson's	Leadenhall-street	1,000	·264	·198
Creosoted blocks (lime joint)	King's-road	407	·111	·204
Plain (asphalte bed)	King's-road	498	·139	·209
Henson's	Brompton-road	584	·184	·236
Creosoted blocks (mastic joint)	King's-road	434	·139	·240
Henson's	Oxford-street (west)	985	·329	·250
Asphaltic	Fleet-street	1,360	·456	·251
Plain	Edgware-road	584	·198	·254
Henson's	Oxford-street (central)	948	·323	·255
Improved	Ludgate-hill	1,236	·428	·259
Lloyd's	Regent-street	558	·214	·288
Plain	Oxford-street	1,164	·475	·306
Asphaltic	Oxford-street	1,137	·484	·319
Asphaltic	Regent-street	558	·286	·384
Asphaltic	Brompton-road	648	·373	·431

With respect to the different systems, it may be observed that as nearly all the wood-paving companies concerned are stated to have either failed or failed to carry out their contracts for maintenance, it is probable that the rates tendered by them for maintenance were, as a rule, far too low, and as Colonel Haywood reported in 1874, that the mean total cost per annum of wood-paving for heavy traffic was 2s. 7½d. per square yard, and for lighter traffic 2s. 4½d. per square yard per annum, this result is not a matter for surprise. The annual wear of wood appears to vary from one-twelfth of an inch per annum per 750 tons of traffic per yard width per diem, for plain pitch-pine pavement, to a little over two-fifths of an inch for asphaltic. In perusing this portion of the work, we notice a considerable number of typographical errors of importance, such as 10 *shillings*, 12 *shillings*, and 17 *shillings*, &c., in place of 1s., 1s. 2d., and 1s. 7d. per square yard for maintenance.

Mr. Stayton entered into very careful calculations as to the actual cost of wood pavement in Chelsea to extend over periods of fifteen and twenty years, including first cost, repairs, renewals every seven years (which he estimates as a fair average life for wood pavement under a traffic of from 500 to 700 tons per yard width per diem), and interest on loans, but not including cost of cleansing and sanding (estimated at 5d. per square yard per annum), and he claimed that the total cost is represented by 1s. 9d. per square yard per annum. On these grounds he justified the economy of removing the macadam from King's-road and Sloane-street, where it had cost 1s. 11d. per square yard for repairs (not including cost of cleansing). In Westminster at the same time it had been as follows:—

	s. d.
Parliament-street	2 10
Whitehall	2 10½
Victoria-street	2 0
Great George-street	1 8
Piccadilly	2 8½

All of which have (as we know) now been repaved with wood.

Mr. Stayton considered that it would be preferable to adopt 5 in. in place of 6 in. blocks, the smaller depth being sufficient, and more economical by 10s. per thousand than the larger, which would be equivalent to a reduction of 1½d. per sq. yard per annum. This depth appears to have been already adopted in several London streets, especially in Kensington, and with satisfactory results. He also considered the plain system of paving preferable to any other—*i.e.*, blocks laid on the concrete in their natural state, with the fibres vertical, and with intervening spaces, ⅜ in. wide, filled in with cement grout (1 to 3), the joints being kept parallel by the addition to each block of three cast-iron studs driven into its side. He attached a good deal of importance to the *expansion* of wood, which generally occurred during the first twelve months or so after completion of the work, and this was provided for by leaving a space near the footways of from 1 in. to 3 in. in width, filling up the space temporarily with sand, subsequently completing with cement grout, and pointing in cement.

It was not to be expected that Mr. Stayton's paper would be otherwise than freely handled by the talented body of experts to whom it was submitted, and especially by those who were favourable to the use of asphalte, and those who preferred the blocks to be either creosoted or pickled, but we must refer the reader to the work itself, or to the Proceedings of the Institute of Civil Engineers, for further information on this head. But Mr. Stayton in his replies furnished a good deal of additional interesting matter, and some subsequent correspondence from other members of the Institution contained much that was valuable, but for which we are unable to afford space, further than to quote an observation made by Mr. W. H. Delano as follows:—"The standard traffic of 750 tons per yard width per diem seemed a misleading formula, for the wear and tear of a road did not depend so much upon the weight passing over it as upon the speed at which that weight travelled. There was also the important element of width of tire, the state of the atmosphere, the camber of the road, and the mode of traffic, cross, heavy, one side empty, the other loaded, &c. Take the new Paris three-horse omni-

C.—ANNUAL COST OF WOOD PAVEMENTS.

System of Wood pavement.	Situation.	Traffic weight per yard width per diem in tons.	Annual cost per square yard for first cost, renewals, repairs, and interest on loans (exclusive of cleansing) if spread over a period of fifteen years.	Proportional relative cost, based on a reduction to an uniform traffic of 100,000 tons per yard width per annum. (Deacon's scale.)
		Tons.	s. d.	s. d.
Asphaltic	Fleet-street	1,359	2 0½	0 5
Plain	Oxford-street	1,164	1 10¼	0 5¼
Henson's	Oxford-street (E.)	1,191	1 10¾	0 5½
Asphaltic	Strand	1,100	1 10	0 5½
Henson's	Oxford-street (C.)	948	1 8½	0 6
Henson's	Fleet-street	1,165	2 1	0 6
Henson's	Oxford-street (W.)	985	1 10¾	0 6¼
Improved	Parliament-street	1,106	2 1¼	0 6¼
Asphaltic	Oxford-street	1,137	2 2¼	0 6¾
Henson's	Euston-road	700	1 5¼	0 6¾
Improved	Oxford-street	985	2 1	0 7
Improved	Leadenhall-street	808	1 9¾	0 7¼
Improved	Ludgate-hill	1,236	2 9½	0 7½
Henson's	Leadenhall-street	1,000	2 8¾	0 9
Plain	King's-road	551	1 8¾	0 9¼
Plain (pitch-pine)	King's-road	468	1 6	0 10½
Plain	Edgware-road	584	1 10¼	0 10¼
Asphaltic	Brompton-road	648	2 1	0 10½
Asphaltic	Regent-street	558	2 0	0 11¼
Henson's	Brompton-road	584	2 1½	1 0
Improved	Piccadilly	800	3 0	1 0¼
Creosoted blocks (lime joint)	King's-road	407	1 6½	1 0½
Plain (asphaltic bed)	King's-road	498	1 10½	1 0½
Improved	Knightsbridge	780	3 0	1 0½
Lloyd's	Regent-street	558	2 2	1 0¾
Creosoted blocks (mastic joint)	King's-road	434	1 10¾	1 2¼
Plain	Sloane-street	279	1 3¾	1 3½
Improved	King's-road	603	3 2	1 5
Improved (pitch-pine)	King's-road	558	3 2	1 6¾

buses, carrying, when full, forty-six people, including driver and conductor, weighing, when full, 5½ tons, the width of the wheel tires being only 3½ in., running at a speed of seven to nine miles an hour, and compare the same weight on a 4½-ft. wide smooth cast-iron roller dragged at one mile and a half an hour. The latter improved a road, whilst the former rapidly destroyed it."

Returning to the subject of cost of wood pavement, the contract for maintaining Piccadilly is 3s. per yard for a period of fifteen years, and that by the same Company (Improved) for Paris is 3s. 2d. per square yard per annum, which probably gives a not unreasonable profit to the contractors if they are held tight to the terms of their contracts. The work contains a reprint of a very complete article on the wood pavements of Paris, including the specification and terms of contract prepared by the Departement des Ponts et Chaussées, and also specifications from Mr. Strachan and Mr. Livingston, the Surveyors of the Chelsea and the St. George's Vestries, the former for the proper supply of all the materials requisite for a wood pavement (including those for foundations), and the latter for the execution of similar work by contract. Reference is also made to the reports and papers on this subject of Mr. Park Neville, Mr. O. H. Howard, Mr. Deacon, and Mr. C. Dunscombe.

Dr. Love, who is the compiler of this work, has treated the subject of asphalte as extensively as he has treated that of wood, including amongst his contributors Colonel Haywood, Captain F. V. Greene (who, as Vice-President of an Asphalte Paving Company, should be slightly discounted when he institutes comparisons between asphalte and other kinds of paving), Mr. W. P. Rice, of Cleveland; Mr. E. P. North, Mr. E. Towle, Mr. Dunscombe, &c. He has also published some valuable specifications,—viz., those for Paris (including the Instructions of 1884) and those for New York and Buffalo. Working out the total cost per annum extended over a period of sixteen years, we gather from Mr. Dunscombe that in Liverpool,—

Asphalte 1 in. thick costs 6½d. per sq. yard.
" 1½ " 9½d. "
" 2 " 1s. 1½d. "
" 2½ " 1s. 2½d. "

In London the pavements of asphalte have cost as follows:—

Val de Travers	1s.
Limmer	9½d.
Société Française	11d.

but this appears to be for maintenance only, and not to include a proportion of first cost.

In some parts of America especial attention appears to have been directed to the preparation of bricks suitable for paving, and the crushing strengths of some of them compare very favourably with some of the less durable stones,—so much so that for light traffic they are in considerable favour in many towns; their advantages are said to be cheapness, smoothness, and cleanliness, freedom from noise and non-absorbence; their disadvantages are lack of uniformity in the material, and the liability of incorporating in the pavement bricks of a too soft and porous nature, which crumble the first winter under the action of frost. They are considered to be superior to macadam and wood, and, for a maximum traffic of 3 tons, also superior to granite.

Dr. Love has devoted a considerable space in his work to curbs (including a novel form of iron curb invented by M. Nicot, a French contractor), to footpaths,—treated of by Mr. H. P. Boulnois, Borough Engineer of Portsmouth, and Mr. Strachan, of Chelsea,—and to tramways. He has also treated on that difficult subject,—namely, how to control the many different parties who for one cause or another are perpetually breaking up the streets. Cleansing, watering, and the removal of refuse are also dealt with, and interesting statistics given of the relative cost of these often-neglected items of expense on the different kinds of pavement.

Mr. Wheeler's article on roads, their repair and maintenance, which was especially written for the National Cyclists' Union, is here reproduced, and M. Waddington, lately French Ambassador to London, has contributed a few useful notes on the administration of the public roads in France. The versatile Captain F. V. Greene has also contributed a most admirable article on roads, including sections of an excellent form of tram-rail, which will not whip off your tyres or twist the spokes out of your naves. The editor has scanned the pages of *Engineering*, and got a good deal out of them about rollers and rolling,—a matter on which so many persons differ. A treatise by Mr. C. Herschel, of Boston, is republished, in which the whole subject of roads is very clearly and almost exhaustively treated.

As we have before said, the editor rarely expresses any personal opinion about the matters which he has collected and compiled into a very valuable work. We do not say that it is presented to us in a very perfectly readable form, or that it might not be slightly readjusted with advantage; but there is very little of it that is not worth reading, and the editor has exercised great soundness of judgment in the selection of his materials.

NOTES.

THE recent notice of the Bank of England in regard to the investment of dividends on Consols is of much general interest and importance, and is a very distinct step in advance and along the path of thrift. The Bank will, in future, invest the dividends as they become due on less than 1,000*l.* of Consols. An order for the investment of dividends must in the first place be given to the Bank; from that time forth the dividends will be invested, the Bank charging a commission of one penny in the pound, which will be deducted from the dividend. The dividend will not be invested until a month after it has become payable, so that if any holder of Consols wishes to make use of a particular dividend he can do so. That this easy method of saving money will much promote thrift we cannot doubt. An artisan, for example, may have his fifty pounds worth of Consols, which, after he has given due notice, will go on accumulating as a provision for old age. The limitation of the amount to 1,000*l.* is specially intended to make the new arrangement beneficial to small investors, and we sincerely hope that in no long time it will be the endeavour of every man in a small way of business to have his holding of Consols gradually accumulating and increasing.

A CORRESPONDENCE has for some time past been carried on in the *Times* on the subject of the relative merits of trial by jury and trial by a judge without a jury. We have more than once pointed out that in nearly every case arising out of building disputes, a trial by a judge, assisted by a skilled assessor, is the most satisfactory. Of course, when a case involves the examination of accounts, or of many details, as is the case when a builder brings a claim for extras, the reasonableness of which is disputed by the building owner, the only satisfactory tribunal is an arbitrator. But both in these cases, and in every other which arises in connexion with buildings, such as whether commission is payable on the sale of an estate, the main thing which parties desire is that the case shall be heard with as little delay as possible, without waste of money in preliminary proceedings. It is interlocutory proceedings which are the bane of our litigation. In nine cases out of ten they have no effect on the ultimate issue. One special value of the Arbitration Act of 1889, was that persons can now enter into a binding submission to arbitration without invoking the aid of the Law Courts by applying to have the submission made a "rule of Court." But in every dispute, if the parties really know what is the actual bone of contention, it should be possible to come to an issue without pleadings and all the legal skirmishing which now often occurs.

PUBLIC attention has this year been noticeably called to the many street accidents which occur in London from time to time. It is obvious that measures should no longer be delayed to facilitate the passage of foot-passengers across the most crowded thoroughfares of the Metropolis. The stoppage of the vehicular traffic every two or three minutes in order to allow foot-passengers to cross is one of the most

serious causes of the derangement of the wheeled traffic, without taking into account the dangers run by pedestrians. The remedy for this state of things is plain and easy. At certain points along the most frequented thoroughfares subways or bridges should be built. These would not only relieve the traffic at these particular points, but at other places, for many foot-passengers would make their way to these points who at the present time cross in any place where they happen to be. There is a subway at Westminster under Bridge-street for the use of Members of the Legislature. This shows that the same work could be constructed in other parts of London. But in many places probably bridges across the street would be best. They might often be constructed so as to be ornaments to the streets. They could be made of light, well-worked, and well-designed ironwork, or of stone. For example, as regards the placing of these bridges, one is much wanted near the Law Courts; more than one is required in the City near the Mansion House. A subway or a bridge should be constructed in Piccadilly, near St. James'-street. But the point we are now insisting on is not the actual places for these works, but the absolute need for their existence. In some places they might even be made to pay for themselves, as recesses might be constructed which would be rented for newspaper or flower stalls.

IT is interesting to note, as a sign of the times, that questions relating to the necessity for the removal of insanitary property are not opposed now as they were formerly. The Salford Town Council have just passed a resolution to the effect that it would be well to proceed at once with a comprehensive scheme for dealing with the insanitary dwellings of the borough. At the meeting of the Council, when this resolution was passed, it was stated that there were two classes of property proposed to be dealt with: that which was absolutely unfit for habitation, and that which was fit for habitation, but which it was desirable to remove for purposes of re-arrangement of sites, &c. As to the first class of buildings, steps were being taken to remove them; but the second class could only be dealt with under a scheme. In most schemes for the removal of insanitary buildings it is frequently necessary to remove dwellings perfectly fit for habitation, and no one, we think, can object to this if the improvements which result from such removals, by the re-arrangements of sites, are desirable, and add to the importance of the locality. At the meeting of the Salford Town Council there seemed to be a unanimous agreement as to the necessity of the proposed improvement, and it was stated that the Health Committee would bring before the Council a comprehensive scheme for the demolition of the particular block which had been referred to, and would ask the Council to provide the necessary funds.

IN reference to the much-spoken-of German National Monument Question (see *Builder*, pp. 372, 444, *ante*), designs have been invited from a limited number of artists, whose names have not been officially mentioned, among whom, however, we are able to name Messrs. Rettig and Pfann and Bruno Schmitz, the first and second prize-winners of the last great competition. The invitations to compete, which have been distributed by special command and under direct supervision of the Emperor, promise each competitor 4,000 marks for his trouble, in consideration of which sum the design becomes the property of the Imperial Government, and they also promise that designs of special merit will receive premiums up to a value of 12,000 marks (some 600*l*.). Not a word is stated as to who will award the premiums. The "programme" for the required designs includes little besides a notification that the proposed extension of the "Schlossfreiheit" is to be the site for the monument, and that the latter is to be in the form of an equestrian statue (in accordance with the Reichstag decision of last session), a few measurements, and a request not to omit the architectural "laying out" of the neighbouring ground. The designs, which are to be sent in by next April, and will then be publicly exhibited in Berlin, are to be partly in model form and partly in geometrical drawings.

IN the list of German cities most visited by Englishmen, Dresden certainly takes a prominent position, but the city has for many a long year been relying on former laurels, and it is only within the last ten years that the catalogue numbers of the collections have shown a perceptible increase. A revival in architectural activity is also now perceptible; municipality, government, and royal household having given their architects and engineers plenty of commissions, and private companies and persons having followed this example; so that, if the general management prove a good one, Dresden, some ten years hence, will certainly be able to find a place in a list of the better class of recently-improved towns of the Empire; at the same time having the advantage of being able to show street fronts of a good freestone, the use of this material, within easy reach of the builder, being usual. Among the new buildings, we may mention the now nearly-completed "Albertinum" (sculpture museum and State record office) and the gigantic block, in course of erection, destined to contain the offices, schools, and exhibition halls of the Saxon "Academy," both of which have found room on the far-famed "Brühlsche Terasse," on the left side of the river; and we must not forget the huge "Ministry of Finance," the foundations of which can be seen on the opposite side of the water. Among the larger schemes which are still on paper we hear of a new central railway station, a much-needed new post office building, and a large block for the municipal offices; whilst among those already worked out and about to be taken in hand next spring we may count the proposed fourth Elbe Bridge and the extensive embankment thoroughfare which is to be laid out on the right hand bank of the river and will form a practical connection between the four large bridges; also the two large covered markets over which so much time has already been spent at the city "Board of Works." The street fronts in the town proper are undergoing a rapid change, new hotels, shops, and office buildings finding their way into the narrowest of streets, and more especially in the newly-opened-up thoroughfares which have been cut through the slums some years ago.

THE sanitary condition of Barnstaple (North Devon) is the subject of a report by Dr. Barry to the Local Government Board, dated July 21. Fatal cases of diphtheria have occurred there, the spread of which appears to have been assisted by want of isolation, but the report as to the sanitary circumstances of the district discloses the usual kind of conditions which precede cases of diphtheria and typhoid. House refuse is generally stored in uncovered ashpits, which are emptied "at long intervals" by the occupiers and the contents used on the land. Excrement disposal is usually by pit privies, "many of which remain unemptied for long periods." In no place is there any public scavenging; the inhabitants being apparently left to clean out their filth receptacles in accordance with their own perceptions or their own indolence. "At Braunton the houses at the lower portion of the village have wells which are liable to pollution; these are sunk only 15 ft. to 20 ft. in the gravel, and as the old square drain used as a sewer is laid in this gravel, fouling of such wells or of some of them must necessarily occur." Dr. Barry reports that the inspectors make regular inspections, and appear to have a good knowledge of the deficiencies of their district, but that by-laws as to dealing with unemptied privies and other receptacles are not sufficiently enforced. Under date July 31 Dr. Barry also reports on the sanitary condition of Easingwold rural sanitary district. Here we have a repetition of the same conditions: rubble drains; wells sunk in contiguity to middens and leaking drains; middens frequently of large size, "and *as the scavenging is left to the occupiers*, accumulations of filth are frequent." This is recurred to several times in the report: "excrement disposed of in uncovered middens which at the time of my visit contained enormous accummulations of filth and ashes," and similar remarks are made about various houses or groups of houses in the district. The key to all this is in the sentence "As the Sanitary Authority do not undertake the removal of refuse the inhabitants have either to undertake this work themselves or to arrange with farmers or others to do it at their convenience; a mode of procedure which *invariably leads to the storage of large accumulations of filth*." It is the same story here as in other rural districts; ignorant persons must have sanitation forced upon them by authority, or they will never have it at all. To leave accumulations of dirt saves trouble, and that is a sufficient defence of it to the uneducated mind. In this report again it is stated that the Medical Officer of Health, Mr. E. Buller Hicks, has a thorough knowledge of his district, and has brought its shortcomings frequently to the notice of the Sanitary Authority, but "much of his advice has been unheeded, or has been attended to in a makeshift manner only." If the Sanitary Authorities are so indolent and careless of their duty, how can we wonder that the people are no better?

IN reference to the class of reports quoted from in the preceding paragraph, we may add that it would be well if the Local Government Board would turn its attention to the sanitary condition of some of the villages on the East Coast which are now becoming largely frequented as watering-places. The town of Cromer appears now to be on the way to a good sanitary condition, though there is much to be done there yet; but the village of Overstrand, two miles off, which is now rapidly rising to the dignity of a watering-place, is in the most primitive state in regard to sanitation. Four years ago (when we gave some sketches from the district in the *Builder*) Overstrand was but a fishing village. Several terraces of "marine villas" have now sprung up, besides two or three detached houses of a better class, and there is talk of a new street and a large hotel. In that case the main attraction of the place, as a quiet seaside resort, will be gone; but that is all the more reason why the drainage should be looked after. What drainage there is appears to be taken to a couple of big cesspools, how often emptied we know not; a grating over one of them is close to the main gangway to the beach, and after heavy rain smells abominably, and as the ground is of a very permeable character, it is not surprising that leakage should have taken place, and that a rivulet of pure sewage should have been seen occasionally down the face of the cliff. A Sanitary Inspector at Overstrand would find some of the same incidents mentioned by Dr. Barry in his above-named reports; middens which the owners are left to empty at their own will, and which are therefore never emptied till dire necessity compels it (a remonstrance from visitors generally producing some indignation), and pumps from which water for all purposes is drawn, standing over wells in happy proximity to the middens aforesaid. Two or three cases of diphtheria are known to have occurred not long since, though the inhabitants have become discreetly reticent on this subject. Under what Rural Sanitary Authority is Overstrand? A very sleepy one, apparently, if any. Lower Sheringham, on the other side of Cromer, has already its big hotel, apart from the village; the latter we only known by a cursory visit, but if the smells of Lower Sheringham are any indication of its sanitary condition, it must want the doctor badly. While speaking of this neighbourhood, we cannot but express the greatest regret also at seeing the beautiful down between Cromer

and Overstrand, known as the "lighthouse hills," offered as building land for residences. This is one of the most beautiful heights on the English coast, and its proximity forms one of the many attractions of Cromer and Overstrand; to build on it would be to deprive Cromer of the best of the very attractions which draw people there, and would therefore probably in the end prove a very doubtful benefit even to the landowner.

TO serve for a public-house by sign of the "Sir Paul Pindar" has been the latter-day fate of one of our best relics of a London merchant-prince's residence nearly 300 years ago. From a brief letter addressed to the *Standard* last week we learn that what yet remains of Sir Paul Pindar's home in Bishopsgate-street-without will, in all likelihood, very soon be "wrecked," having been acquired, together with some adjoining property, by the Great Eastern Railway for the extension of their Liverpool-street terminus. We understand that the demolition will ultimately extend to all the property between the ends of Worship-street, in Norton Folgate, and Liverpool-street. It is stated that Pindar—a contemporary, in his boyhood, of Gresham, and son of Thomas Pindar, or Pinder, of Wellingborough—built this house upon his return from Italy at the end of Elizabeth's reign*; and he is said to have been visited here by her two successors on the throne when they wanted to borrow of his ample gains. At the Turkey Company's instance, James I. despatched Pindar, in 1611, to, as the epitaph says, "the Turkish Emperor." He returned, greatly enriched, after nine years' absence. Having benefited his Royal masters to his own serious embarrassment, Pindar died in 1650, aged eighty-four years. He was enthusiastic for architecture, and contributed 10,000*l.* towards the screen and south transept for Inigo Jones's work at old St. Paul's. Pindar's house and its park-lodge in Half-Moon-street have been frequently illustrated. Their later aspect may be seen in several views at the Guildhall Library, where also is a copy of Schnebbelie's plan of the old London Workhouse, the house, lodge, &c. We may also refer our readers to J. T. Smith's "Ancient Topography of London" (1812), and Wilkinson's "Londina Illustrata." Smith gives a drawing (made in 1792) of the interior of a first-floor room, showing the ornamentation of its ceiling, panels, wainscot, and chimney-piece,—decorations which, as he tells us, were cut away in 1811 in order to render the room "a little comfortable." The Pindar coat-arms were found beneath a sheet of metal fastened on to the ceiling. Reduced from its pristine proportions, deprived of its large garden planted with mulberry-trees, mutilated and defaced without and within, this old house still retains portions of its exterior towards the main road. A solitary gable rises above the first and second floors, of which latter the windows project oriel-wise far beyond the ground story. The whole front forms a specimen of domestic work, in wood, richly carved, so singular of its kind, that we trust some steps will be taken to save it from destruction. A magnificent ceiling was removed to the South Kensington Museum from the house next door (southwards), which some consider to have been part of Pindar's house, and since pulled down. The Reverend Thomas Hugo contributed a paper to the London and Middlesex Society (printed in their Transactions, 1857), descriptive of this house, and of some plaster ceilings in various tenements at the rear, highly decorated with figures, wreaths, shields, ribands, and the like. A clearance has lately been made on the site of these houses for purposes of the railway.

THE death of Miss North should not be allowed to pass without brief notice. She possessed in a remarkable degree the power of portraying flowers. This kind of still-life art is one which is, generally speaking, too purely imitative to be ranked very high. For decorative purposes it is of value, but in our opinion to hang portraits of flowers round a room is nearly as bad as placing artificial flowers on a table. But Miss North used her special gift not only for the advancement of knowledge, but as a means of enabling the people of this country to become acquainted with the appearance of the flora of nearly every country under the sun. Miss North's collection of the portraits of flowers at Kew will be a perpetual monument to her indefatigable zeal in portraying the flowers of the world, and will be a continual source of interest, pleasure, and recreation to thousands. It would be useless to enumerate the countries in which Miss North had travelled. In 1870 she visited Canada, the United States, and Jamaica, and her last journey a few years ago was to South America. Since that time her health has been gradually failing, and she has lived in complete retirement at her house in Gloucestershire, ever interested in her garden, which was a treasure-place of rare and beautiful plants collected in all parts of the world.

THE silly knot of persons at St. Albans who thought it worth their while to propose a testimonial or monument to Lord Grimthorpe for amusing himself by disfiguring their Abbey, have got the snub they might have expected from their genial idol. Lord Grimthorpe's letter to a local journal on the subject discloses a new phase of his self-appreciation, however. A little while ago we suggested that the motto over Wren, "Si monumentum requiris, circumspice," would be an ingenious sarcasm to erect over against St. Albans. Lord Grimthorpe however, we find, actually adopts Wren's epitaph as the one most appropriate to himself, only pointing out that Wren "did not pay for the building." It appears therefore that Lord Grimthorpe seriously imagines that his work at St. Albans has set him on a level with the designer of St. Paul's! Such vanity would be a spectacle for amusement if unfortunately the results of it were not so permanent. That it "will be there for many centuries" is probably true, for it is solid building enough; but it will be there for the laughter and not for the admiration of posterity.

LETTER FROM PARIS.*

THE distribution of medals and diplomas in connexion with the Great Exhibition is to commence immediately, and to be carried on continuously in the order of the classes and groups. It has been delayed partly for the engraving of the diploma form, which has occupied no less than seven months. It is expected that the condemned buildings on the Champ de Mars will be removed by the end of the month, and the treatment of the buildings to be preserved will then be taken in hand. MM. Bouvard and Formigé will in the first instance replace all the essentially temporary work on their respective buildings by solid materials, before the special use of these buildings is actually entered on. It is said to be pretty well settled now that the Palais des Beaux-Arts will become the permanent abode of the long-talked-of Musée des Arts Décoratifs.

As we have before mentioned, it was formerly intended that this Museum should be built on the site occupied by the ruins of the Cour des Comptes. What will become of the latter if the Government ratify this new idea is then the question; and probably there will be no course but to remove and sell the ruins of the Cour des Comptes as old materials, and leave the site free for other purposes. Every one in Paris will be very glad to see the last of them, the remains being both unsightly in themselves and having disagreeable memories connected with them.

There is talk also of transferring the offices of the Minister of Finance, which since 1870 have occupied a part of the Louvre, to the site in the Boulevard St. Germain now occupied by the War Department, the latter being transferred to the Hôtel des Invalides, too large now for its remnant of pensioners, and where the headquarters of the Military Staff are already established. By this arrangement, the Louvre buildings will be left entirely free for artistic objects. All the *personnel* of the museum could be installed in the Pavillon Flore and the Pavillon Marsan, and the State would possess the whole immense palace for its collections. If these projects are not immediately realised, the arrangement for them seems to show that the Direction des Bâtiments Civils is awaking a little out of its proverbial torpor.

In the Louvre itself further alterations have been going on, and the Salle Rude, closed for some time past, is now re-opened and enriched with some of the splendid bronzes of Barye, and also some of the various works of Carpeaux, including the well-known group of "the Dance." The Salle des Sept Cheminées has totally changed its aspect. In that room are now exhibited the "Sacre" of David and the "18th Brumaire" of Bouchot; while in the Salle de Beauvais the ceiling has been "marouflé" with the immense decorative painting by Carolus-Duran, "Gloria Mariæ Medicis," which, since its appearance at the Salon of 1878, has been the subject of violent polemical criticism. This canvas, originally intended for the Luxembourg, has been placed in a framework designed in the style of "La Siècle," with escutcheons with the arms of France and of the Medicis. Lastly, we have to mention at the Louvre the legacy of sketches by Carpeaux left by the late Philippe Burty, and the re-exhibition of a number of splendid miniatures of the fifteenth and sixteenth centuries which have been for years hidden in the store-rooms of the Louvre for want of space to show them.

The repairs at the Pont Neuf have uncovered the ancient piling, about which there is some interest. These piles, which date from the year 1602 at least, the time when the bridge works were being most actively carried on,—or perhaps from 1578, the year when Henri III. laid the first stone,—are in a state of perfect preservation. A little smaller than the piles in use to-day, they are mostly square in form, and in those days were driven by immense mallets worked by hand. The foundation-stones appear in a sound condition; they terminate in steps to which the piles serve as base, and which were probably formerly above water, the level of the Seine having been lower then than since the water has been confined between quays. In spite, however, of this surprising state of preservation of the foundations, there has been a perceptible settling in the bridge, which has called for immediate attention.

Another structure, not quite so old, but venerable for a railway structure, the Gare des Sceaux, has been giving the same kind of trouble, cracks having been heard and crevices seen in its walls. It has been necessary to shore it up at once The excavations which have been made for the purpose of repairing the walls have revealed the fact that a part of the station is built over some old quarries, and a considerable amount of underpinning has been necessary to render the buildings secure for the limited time for which they are required, until the completion of the new terminus on the Place Medicis.

In the Garden of the Luxembourg a bronze bust of Delacroix has just been placed, a fine work by Dalou, who has also executed the allegorical group for the pedestal, representing "Le Temps portant la Renommée." The principal face of the monument will bear the simple inscription—

À EUGÈNE DELACROIX
SES ADMIRATEURS.

The work will probably be inaugurated towards the end of September. In connexion with this subject we may mention that the Commission des Musées Nationaux has selected the following works to be added to the Luxembourg collection: in sculptnre, "La Sirène" by M. Puech, and the "Gilliatt" of M. Carlier: in painting "Les Blés," by M. Quignon; "Le Rêve," by M. Richemont; "La Vache Blanche," by M. Julien Dupré; "La Fôret d'Arques," by M. Gosselin; a still-life painting by M. Desgoffe; an "Etude de femme" by M. Carolus Duran, and a "Halte de Cavaliers" by M. John Lewis Brown.

On the right bank of the Seine the buildings of the new Sorbonne are being carried on without interruption, and on the left bank the exterior of M. Bouvard's new Bourse is nearly finished. Of the design of this building we have before spoken. Not far from it the works connected with the Belleville rope railway are nearly completed. This new means of getting to the summit of the Twentieth Arrondissement will probably be completed and opened for

* Yet his epitaph at St. Botolph's-without describes him as "an inhabitant *twenty-six* years, and bountiful benefactor to this parish." Many particulars of his career are set out in the MS. of the funeral sermon preached by Nehemiah Rogers.

* Unavoidably postponed from last week.

traffic in October. A still more important class of new works, perhaps, will be the substantial school buildings which the Municipality is shortly about to erect on the sites where wretched wooden barracks have been run up as schools, provisionally, since the time when, eight years ago, Parliament made gratuitous primary instruction obligatory. About eight to ten million francs will be spent on these permanent schools.

Two years ago, on the occasion of the annual congress of architects, we gave a description of the Russian church in Rue Daru, which up to the present time has been the only church in Paris dedicated to the orthodox rite of the Greek Church; but it is announced that another church for this worship is to be erected shortly in the Rue Bizet, near the Arc de Triomphe, in the centre of the favourite residential quarter of the Hellenic colony in Paris. It is a Greek resident, M. Demetrius Tzani Schillizi, who has given the sum of two million francs for the work, which is to be in Byzantine style and surmounted by three cupolas.

The Railway Company "de l'Est" has just commenced some important works for the enlargement of the Gare de Strasbourg, which for a long time back has been quite insufficient for the traffic.

M. Poilpot's new panorama of "Les Engagements Volontaires de 1792," in the Bastille neighbourhood, has only been opened to the public for a few weeks before it has been destroyed by fire. Without having, of course, the high artistic qualities of the panorama of the Battle of Rezonville, by two such masters as Detaille and de Neuville, the work of M. Poilpot offered nevertheless a very interesting spectacle, especially as a picturesque restoration of a corner of old Paris. The spectator, supposed to be standing on the Pont Neuf, witnessed a scene full of life, framed amid the remarkable buildings contiguous to the two arms of the river, and looked across the quarter of the Arsenal to the wooded height of Chaillot, where the Trocadéro now stands. M. Poilpot, thanks to his assiduous researches, had revived a great deal of the ancient aspect of Paris, and among archæologists the merit of his work in this respect was admitted.

The Académie des Beaux-Arts held a sitting recently to award the grand prix de Rome in architecture. The first prize has been awarded to M. Pontremoli, a native of Nice, and a pupil of MM. André and Lalou. The "deuxième premier" was awarded to M. Sortais, pupil of Mm. Daumet and Guadet, who in 1888 obtained the "premier second grand prix," which this year has been carried off M. Louis Varcollier, pupil of his father and of M. Ginain. M. Bossi, pupil of M. Pascal, obtained the "deuxième second." The subject of the competition was "Un Monument à Jeanne d'Arc," and the instructions indicated the side of a hill above the Seine, and in the neighbourhood of Rouen, as the supposed site. The competitors had reason to be grateful for this instruction as to site, which lent itself to such effects as successive terraces and porticoes, or an immense staircase leading up to a shrine before which was an equestrian statue of the heroine. The works exhibited, though very interesting, did not however strike us so much from the point of view of idea as of execution.

The Jury of the École des Beaux-Arts has given judgment on the competition for the first class of architectural students, the subject being "Un Theâtre de Grand Opéra." Second medals were awarded to M. Guilbert, pupil of MM. André and Lalou, to M. Cargill, pupil of MM. Daumet and Girault, and to M. Duquesne, pupil of M. Pascal.

There is an intention of modifying the regulations of the École des Beaux-Arts, so that in future (if the Minister confirms the decision of the superior Council of the École) the ateliers, of which the direction is confided to certain artists named by the Government, will be freely open to young students without a preliminary competition. Besides this, the subjects of anatomy, modelling, architecture, and history will not be so important as that of design, and will serve only to assist in the classification of the pupils. One effect of this will be that we shall not again see, as has been the case, a pupil who has taken a high position for design being refused his position for not having given the correct date of the First Crusade. A man may certainly be an able sculptor, painter, or architect, without being strong in history.

We may mention lastly that a school of design for girls has been formed in connexion with the School of Decorative Art which is to be installed, it is expected, in the old buildings of the Hôtel Dieu. M. Dutert, the architect of the Palais des Machines, has been appointed joint inspector of the school of design.

We have to record the death of M. Georges Coutan, a decorative designer, and the husband of Mdme. Laure Martin Coutan, herself a talented sculptor; and also that of M. Emile Levy, who died suddenly when just about to commence the decoration of the Salle des Caryatides in the Hôtel de Ville, in the first instance assigned to Cabanel. Levy was sixty-four years of age, and was a pupil of Abel, Pujol, and Picot. He obtained the Prix de Rome in 1854, and received medals in the Salons of 1859, 1864, 1866, and 1867; he received in the latter year the Cross of the Legion of Honour, and a medal of the first class in the Universal Exhibition of 1878. Among his principal works may be named "Ruth and Naomi," the great work entitled "Musique Sacrée et Musique Profane," "La Danse," and "La Prière aux Champs." He had recently been commissioned to decorate the Mairie of the Sixteenth Arrondissement. He was an artist of talent, a pastellist of the first rank, and excelled especially in female portraits and in allegorical compositions of a somewhat archaic style.

HAMBURG CONGRESS OF ARCHITECTS AND ENGINEERS.

THE Amalgamated Societies of German Architects and Engineers held their ninth congress at Hamburg during the last days of August. Of the German societies, the greater number of the larger ones (some thirty with 6,000 members) form or rather belong to the national amalgamated "Society of German Architects and Civil Engineers," and it is this powerful body that, besides having its annual meeting of deputies, has its biennial gathering (held each time at a different town), at which instructive sight-seeing, accompanied by good lunches and dinners, meeting of old friends, not without boisterous merriment, are the order of the day, and at which conventional speeches, lectures, and debates, whatever be their intrinsic value, only come into secondary consideration. The number of members present at such a biennial gathering greatly depends on the advantages which the elected town promises its visitors. If the town, besides having ordinary or special advantages for sight-seeing, neighbourhood, &c., happens to be known as a rich and hospitable one, and if there happens to be an energetic architectural society on the spot to take the management of the reception in hand, there is sure to be a good contingent of members present; and if the town at the same time be a popular one, and have some special patriotic feature for the "Fatherland" lovers within easy reach, the attraction will be greater still, and the numbers will probably exceed the usual average.

So it has proved at Hamburg, where, instead of the 700 expected guests, 1,300 appeared, and although this number is very small in comparison with the number of architects in the Empire, and although the most esteemed of the profession were, for the most part, absent, and the field was nearly entirely in the hands of those who excelled more in wit or popularity than in their work, the show was certainly a stately one, and the gathering as a whole a great success.

It would take too much space to follow up the doings at the Congress day by day; yet it may be well to state that our friends over the sea ought to think themselves lucky to have a possibility of being received as they have been at Hamburg, by the authorities, the companies, and private persons. From the official opening day on the 24th, to the close on the 28th, the time was so instructively and enjoyably filled up as is seldom the case, and it was not till the Hanse city had been left, and the excursions to Lübeck, Kiel, and the North Sea-Baltic Canal had been successfully completed, that the visitors had any time for the much-needed rest after such a week of hard sight-seeing and late hour festivities. We may mention that every portion of the town and its surroundings was visited, mostly in groups under able and practical guidance, that all Government and municipal buildings or works were open to inspection, and that the proprietors of the numerous picturesque, well-planned, and luxurious villas had thrown open their homes, partly for inspection, partly for hospitality. Inspections were done on a large scale, half a dozen steamers being employed on the harbour and Elbe, and quite a flotilla of boats and tugs on the Alster, and when it came to the grand patriotic part, *i.e.*, the visit to the newly-acquired Heligoland, two first class American passenger steamers (the *Columbia* and the *Moravia*) were lent by the Hamburger Packetfahrt-Gesellschaft, the managers of which entertained the whole of the company to a sumptuous dinner on board. The town gave a banquet; at Blankenese a dinner was given; on the Alster lakes an "Italian night" with fireworks was arranged, and on the Elbe, outside the town, the rows of villas celebrated the passing of the guests with a general illumination and successive fusilades of rockets, forming effects not easily forgotten by those present. In fact, in and outside the city, authorities and civilians all vied in their attempts to do their best for the visitors.

As observed, at these gatherings the lectures, with their debates, come into secondary consideration. The early hour at which the lectures were started caused the splendid hall in which they were held to have (excepting on the opening day) a more empty appearance than necessary,—a fact, however, by no means surprising to those who know what an evening festivity among old German friends means. The lectures, which, as a rule, were well received, mostly took the form of papers read by their authors before publication, and they are now to be found printed full length in our foreign contemporaries and in the Hamburg local press. The discussions that sometimes followed were of a very poor kind, so that, interesting as the topic might be, there was throughout a certain feeling perceptible that the "work" was but a farce, and that the sooner it was done with the better.

As the papers in themselves were of value, it will only be right to mention them, especially as the amount of labour each of them contains ought not to be undervalued. The most popular lecture, we believe, was the one read by the president of the Hamburg Society, Herr Andreas Meyer, on the first day, under the title of "Hamburg and its Buildings," and it was, certainly, thanks to this concise description of the town that the visitors got a clear idea of what was to be seen, without having waded through the large volume bearing the same title, which has been published for the occasion and contains very minute details. A paper read by Professor Hubert Stier (Hanover), before a very good audience of architects was exceedingly well received. In accordance with the heading, "Results of German Architectural Competitions during the last Twenty-two Years," the Professor gave, besides general comments, some very interesting statistics about the 258 competitions opened in the Empire since 1868. To Baurath Hobrecht (Berlin) fell the highly-interesting theme, "Street Building in Cities, with Special Regard to their Future Requirements of Underground Connexion," and in this paper comparisons with London arrangements played an important part. Under the title, "Contemplations on Style," the editor of a Berlin contemporary, Herr Fritsch, read a somewhat lengthy but able paper, in which he made comparisons with the styles of former times, referred to the expected future development, and the means that should be employed to keep this development on a natural basis. For the civil engineers an excellent paper on "Wide-span River and Valley Bridges" was read, and the day before the trip to Heligoland a very suitable lecture was given on "Modern Steamships and their Machinery." In all cases the lecturers had taken special care to prepare their subjects, and it may be expected that the amount of material collected will be turned to some good account, either as a basis for future discussions in the different societies, or as preparatory essays for books about to be published.

In 1892 the gathering will be held at Leipsic, but we are afraid that this town has been ill-chosen, the contrast between the two being too great.

OPENING OF A NEW BRIDGE IN BELFAST.—The new Albert Bridge, built by the Belfast Corporation at a cost of 36,000*l*, across the river Lagan, the foundation-stone of which the Duke of Clarence and Avondale laid about a year ago, and which is intended to take the place of the old stone structure which collapsed four years ago, was opened by the Mayor of Belfast on the 6th inst.

THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

ALTHOUGH this year's meeting of the British Association (which has been held in Leeds for a second time, after an interval of thirty-two years) has not been so largely attended as last year's meeting, it seems to have produced a fair number of interesting papers in the various sections.

The President, Sir Frederick Abel, in his opening address, dealt mainly with two subjects,—Applied Electricity, and Explosives. We give a few condensed extracts from it:—

Electric Lighting.

While the prediction made by Siemens, eight years ago, that electric lighting must take its place with us as a public illuminant, has already in a measure been fulfilled, important progress is being continuously made in developing and perfecting the arrangements for the generation of the supply, its efficient distribution from centres, and its delivery to the consumer in a form in which it can be safely and conveniently dealt with and applied at an outlay which, even now, does not preclude a considerable section of the public from enjoying the decided advantages presented by electric lighting over illumination by coal-gas. Yet our recent progress in this direction, encouraging though it has been, is insignificant, as compared with the strides made in the application of electric lighting in the United States, as may be gauged by the fact that while in America the number of arc lamps in use in April of this year was 235,000, and of glow-lamps about three millions, there are at present only about one-tenth the number of the latter, and one-hundredth the number of arc lamps, in operation in England. In some important directions we may, however, lay claim to rank foremost in the application of the electric light; thus our large passenger ships and our warships are provided with efficient electrical illumination; to the active operations of our navy the electric light has become an indispensable adjunct; and our system of coast defence by artillery and submarine mines is equally dependent for its thorough efficiency upon the applications of electricity in connexion with range-finding, with the arrangement and explosion of mines, and with the important auxiliary in attack and defence, the electric light. Other important applications of the electric light, such as its use as a lighthouse illuminant, for the lighting of main roads in coal mines, and even for signalling purposes in mid-air, through the agency of captive balloons, are continually affording fresh demonstrations of the value of this particular branch of applied electric science.

Power Electrically Transmitted.

The Paris Electric Exhibition afforded interesting illustrations of the performance of a variety of work by power electrically transmitted, including a short line of railway constructed by the firm of Siemens, which was a further development of the successful result already attained in Berlin by Werner Siemens in the same direction, and was, in its turn, surpassed by the considerably longer line worked by Messrs. Siemens at the Vienna Exhibition. Various short lines which have since then been established by the firm of Siemens are well known, and one of the latest public acts in the valuable life of Siemens was to assist at the opening of the electric tramway at Portrush, and where the idea, so firmly rooted in his mind from the date of his visit to the Falls of Niagara, in 1876, of utilising water-power for electrical transmission, —a result first achieved on a small scale by Lord Armstrong,—was more practically realised than had yet been the case. Since that time Ireland has witnessed a further application of electricity to traction purposes, and of water-power to the provision of the required energy, in the working of the Bessbrook and Newry Tramway; while London at length possesses an electric railway, three miles long, to be very shortly opened, which will connect the City with one of the southern suburbs through a tram-subway, and, although including many sharp curves and steep gradients, will be capable of conveying one hundred passengers at a time, at speeds varying from thirteen to twenty-four miles per hour. During the past year a regular service of tramcars has been successfully worked, through the agency of secondary batteries, upon part of the large tramways of North London, with results which bid fair to lead to an extensive development of this system of working. The application of electricity to traction purposes has, however, received far more important development in the United States; at the commencement of this year there were in operation in different States two hundred electrical tramroads, having a collective length of 1,641 miles, with 2,346 motor-cars travelling thereon. Further extensions are being rapidly made; thus, one company alone has thirty-nine additional roads, of a collective length of 385 miles, under construction.

Electric Welding.

The successful practical realisation of Joule's predictions in regard to the application of electric currents to the welding of iron and steel, and to analogous operations, through the agency of the efficient machines devised by Professor Elihu Thomson, was demonstrated to the members of the Association by Professor Ayrton at Bath two years ago, and was shown upon a larger scale to visitors at the Paris Exhibition last year, and recently to highly interested audiences in London by our late President, Sir Frederick Bramwell. At the Crewe Works, Mr. Webb is successfully applying one of these machines to a variety of welding work. With such practical advantages as these, electric welding bids fair to receive many useful applications. Another very simple system of electric welding, especially applicable to thin iron and steel sheets, hoops, &c., has been contemporaneously elaborated in Russia by Dr. Bernados, and is already being extensively used. The required heat at the surfaces to be welded is developed by connecting the metal with the negative pole of the dynamo-machine, or of a battery of accumulators, the circuit being completed by applying a carbon electrode to the parts to be heated. This mode of operation appears to have been practised upon a small scale, some years ago, by Sir William Siemens, to whom we also owe the first attempt to practically apply electric energy to the smelting of metals.

Science applied to Mining.

Reference was made to the production of new explosive agents for mining and quarrying purposes, to the improvements of safety-lamps, and to the provision of serviceable, safe, and portable electric lamps for use in mines. The recent legislation in connexion with mines is (said the President) certainly deficient in any sufficiently decisive measure for excluding from mine-workings certain forms of lamps which, while fairly safe in the old days of sluggish ventilation, are unsafe in the rapid air-currents now frequently met with in mines. It is, however, very satisfactory to know that the strong representations on this subject made by the late Commission, combined with force of example, and with the conclusive demonstration of the superiority of other lamps, have led within the last two years to the very general abandonment of the unprotected lamps in favour, either of simple, safe, modifications of these, or of other safe and efficient lamps. In one important respect recent improved legislation has failed to effect a most desirable change, —namely, in the substitution of safety-lamps for naked lights in workings where small local accumulations of fire-damp are discovered from time to time. There appears little doubt that one of the three fearful explosions which have occurred within the last twelve months (the explosion at Llanerch Colliery, near Pontypool) was caused by the continued employment of naked lights in a mine where inspection constantly revealed the presence of fire-damp. This explosion, and two other terrible disasters—at Mossfield Colliery, in Staffordshire, and at Morfa Colliery, near Swansea—which have occurred since the last meeting of the Association, may have seemed to weaken the belief that the operation of the recent Mines Regulation Act must have resulted in very substantial improvement in the management of mines and in the conduct of work by the men. Happily, however, there is a consensus of opinion among those most competent to judge —*i.e.*, the Government Mine Inspectors—that very decided benefits have already accrued from the operation of the new Act. We may hope, moreover, that the operation of the Act is paving the way to more comprehensive legislation in the near future; for it can scarcely be doubted, by the light of recent sad experience, that there are directions in which both masters and men still hesitate to adopt, of their own free will, measures or regulations, methods of working or appliances and precautions, which are calculated to be important additional safeguards against mine accidents, and which are either left untouched or only hesitatingly and imperfectly dealt with in the recent enactments.

Railway Routes to the East.

In the Geographical Section, on the second day, Sir Frederic J. Goldsmid read a paper on "Railway Routes from Europe to India." It was intended as a supplement to one read in June, 1878, at the Royal United Service Institution, on "Communication with British India under Possible Contingencies." The main object on that occasion was to advocate the construction of a line of railway connecting the eastern shores of the Mediterranean with the western coast of India by a direct, convenient, and politically expedient route. It was not originally laid down with any precision what should be the actual course taken by the through line to India when branching off from the Lower Euphrates. Surveys and reports by recent travellers had now rendered it easy to supply this link of rail, one which might be appropriately called the Baghdad-Bandar-Abbas section, or, more minutely, the Baghdad-Shiráz and Shirás-Bandar-Abbas sections. As to the route from Bandar-Abbas to Karáchi on the east, and from Tripoli to Baghdad on the west, any doubts or difficulties that presented themselves were already ripe for discussion, and their solution would not be treated as dependent upon further travel and research. It was proposed to carry the line from Baghdad through Persian Arabistan, either by way of Dizful and Shustar, continuing along the recognised track from the latter place to Bebehan; or by an alternative route down the left bank of the Tigris, and *viâ* Haweizah to Ahwaz, whence Major Wells, R.E., had furnished full details of the route from his own experiences. The same officer had made, moreover, very valuable suggestions on the mode of reaching Shiráz from Bebehan. After mentioning other routes available, Sir F. Goldsmid said that he had great faith in the drastic remedy of the iron rail and locomotive to awaken a slumbering but active-minded people, for whom it would be a novelty of high price and usefulness. He did not, however, disguise the fact that the scheme of railway which he described had not had its origin in the mere wish to benefit a particular nation, but rather in the intention of putting in a 900-mile link in the inevitable great line which would some day connect England with her Indian Empire, and which should be as readily available to passengers and goods as any of the more popular and successful lines at home.

Cable Tramways.

In the Mechanical Science Section, on the third day, Mr. W. Newby Colam read a paper on "Cable Tramways." He thought that the present was not an inopportune time for bringing this subject under the consideration of the British Association, because the conditions imposed upon the public had so changed of late as to make it necessary to adopt some system of locomotion whereby the public could be carried at cheaper rates, and more quickly than by the plodding horse. He briefly referred to the various means of utilising electricity, air, steam, gas, and ammonia for street traction, and considered that only two of them had been working a sufficient time to afford a commercial test which would survive. These, he said, were the cable and steam locomotives. Of the electrical motors undergoing commercial trials abroad, he was of opinion that the storage system was the only one likely to be seriously entertained in this country for street purposes. The author hoped that the day was not far distant when it could be proved that this means of applying electrical locomotion in streets could be worked at a fair remuneration over the average roads, because he considered it would then have a big field of operation. He, however, had formed the opinion that electrical engineers had many difficulties to surmount before this class of motor could face the varied work of ordinary streets and pay well in this country. Steam-engines were, in his opinion, not likely to receive much attention in the future for the purpose of traction through streets, but he thought they would be found useful as a means of connecting districts. Under the circumstances, he suggested that the cable might be found the mechanical power to supersede horses in cases were horses were clearly not capable of meeting the new

conditions of travel. The author next described the origin of cable tramways. He said success had attended almost every inauguration in America and elsewhere, notwithstanding quite unnecessarily large capital outlays. There are at present 501 miles of cable tramways at work, which carried last year in the States nearly eight hundred millions of people, or nearly double the passengers carried in Great Britain and Ireland. Abroad dividends of 74 per cent. had been earned, and in England they were now being worked at 4 per cent. of the gross receipts. Mr. Colam gave his opinions as to the requirements to be observed in designing cable tramways in order that they might meet with the approval of local authorities and ensure economical results. He described two lines he had made in Edinburgh, and he ventured on a prediction that the low constructional and equipment cost of such a system would not fail to attract the attention and demand the consideration of tramway authorities. In concluding his paper, the author spoke of the remarkable success which had attended the working of cable tramways in Chicago and also in the Brooklyn district of New York.

The Utilisation of Compressed Air.

In the same Section, Professor A. Lupton read a paper on "The Pneumatic Distribution of Power." In his opening remarks, Professor Lupton said he did not intend to go over ground which had already been trodden by other scientists, and on similar occasions to the present. He said he should chiefly confine his observations to the experience which had been derived from the working of this system in Birmingham, and he remarked that the subject should be of peculiar interest in Leeds, because the local authorities had obtained an Act of Parliament for the use of compressed air throughout the borough. He showed how the supply of this air through a meter induced economy on the part of the consumers, and he provided the section with numerous and interesting particulars as to the use of this air in the propelling of tramcars, in the working of the electric light, for various domestic purposes, and in Paris for the emptying of cesspools. At considerable length he showed the great advantages of a power suitable for large or small motors that could be cheaply and safely introduced in workshops, houses, and shops—a power that would do the heavy work of a millcourse or ironworks, and the light work of the tailor, shoemaker, printer, hairdresser, and grocer; that would drive dynamos for electric lighting, and had many other applications, as was, he said, universally admitted. In Birmingham there were three steam-engines of 1,000-horse power which compressed air to a pressure of 45 lb. above the stmosphere, and delivered into pipes which were laid in the streets like gas-pipes, and over four miles of the pipes were there laid. The works had only just left the hands of the contractors, but already there were forty customers for air power, some of them at a distance of one and three-quarter miles from the compressing station. The loss of power by friction in the pipes was so slight that no ordinary gauge would show it—practically, there was no loss of power due to this distance. The engines of the consumers varied in size from ½-horse power up to 50-horse power. At one works they were now using about 100-horse power, which drove four or five engines, also the blacksmiths' fires, the blast of the cupolas for iron smelting, and it was also used for several novel processes, economising labour and material, that had been discovered since the power was laid on. Some difficulty had been found in getting a good meter, but Mr. Abrahams had now invented and patented a meter that was correct within 1 per cent. There was now a demand for the power, which gave satisfaction to those who had tried it. Some people had actually moved into the district for the sake of the convenience of having power without having to erect a boiler and chimney. Comparing the mechanical results with the prophecies that were uttered in 1886, he mentioned that then it was alleged by some that the engines as designed could not be erected, but they had been now safely set to work. It had also been asserted by some that the loss of power in compressing was such that 25 to 30 per cent. was the maximum proportion of the original steam-power that could be used by the consumer's engines. The results, however, had entirely confirmed the statements of the engineers, Messrs. Sturgeon and H. Robinson. At one works visited by him (Professor Lupton) the indicated horse-power of the consumer's engine was equal to 73 per cent. of the indicated horse-power of the steam-engines at the compressing station,—a result which he considered very satisfactory. This result was partly due to the re-heating of the air in a stove, where the sweepings of the workshop were consumed without cost. In consequence, he said, of these satisfactory mechanical results, the Air Compressing Company were about to extend their works. The Professor went on to say that compressed air could be used for working tramways under the patents of Hughes and Lancaster. Under this system a pipe was laid in the streets for the supply of compressed air to the cars, which cars carry the machinery for propulsion, and can ascend any gradient that a locomotive can mount, and take in fresh supplies of compressed air at every stopping-place, an operation which can be effected without actually stopping the car. An experimental car on this principle had been run on the Chester Tramway.

A Possible New Process for Copying Drawings.

In the Chemical Science section, on Tuesday last, Mr. A. G. Green read a paper entitled "The Action of Light upon the Diazo Compounds of Primuline and Dehydrothiotoluidine: a Method of Photographic Dyeing and Printing," prepared by himself, Charles F. Cross, and Edward J. Bevan. In the course of the paper Mr. Green said it had long been observed by him that the diazo compound of primuline was very sensitive to the action of light, being readily decomposed thereby, and losing its property of combining with phenols and amines. Upon this fact they had now founded a photographic process, by means of which designs can be produced in fast colours upon cotton, silk, wool, linen, or other fabrics. It can also be applied to wool, xylonite, celluloid, paper, or to gelatine films upon glass, thus affording a very wide range of employment. The process, which is a very simple one, merely depends upon the fact that if a material containing diazotised primuline be exposed to light under a design, those parts which are acted upon by light will be decomposed, whilst the parts protected from the light will remain unaltered, and consequently, on subsequent development with a phenol or amine, will produce colours, whilst the decomposed portions will not. The details will, of course, depend somewhat upon the material to be treated. Paper for copying drawings, &c., is coated on the surface with primuline by means of a brush or roller. For the production of gelatine films upon glass the primuline is incorporated with the gelatine before being applied to the glass. In place of ordinary primuline the homologues already mentioned may be used. For silk and wool the primuline may be replaced by dehydrothiotoluidine-sulphonic acid, by means of which colourless backgrounds may be obtained. Concerning the reaction which occurs when the diazo-primuline or the diazo-dehydrothiotoluidine is decomposed by light, nothing definite could as yet be said, except that the diazo group is completely destroyed; for on treatment with sodium hydrosulphite (true hyposulphite) it cannot be converted into the amido-group (reforming primuline or dehydrothiotoluidine). The reaction may consist in a replacement of the N_2 group by OH or by H, or may be even more complex. Although it could not be affirmed that this reaction to light is a property of the diazo-compounds of this group of bodies only, yet it is certain that they possess an extreme susceptibility to light, far greater than that of other diazo-compounds, whilst at the same time they are far more stable to heat. It is thus possible that this property may depend in some way upon the sulphur which they contain.

The President (Prof. T. E. Thorpe) remarked that Mr. Green's discovery was another instance of history repeating itself. The old process of reproducing architects' and engineers' plans on a blue background with white lines was likely to be run very hard by the one they had had unfolded to them by Mr. Green. When Sir John Herschell occupied the post he (Professor Thorpe) now filled, on the occasion of the previous meeting of the British Association in Leeds, the blue background process was in full vogue; now they were likely to have another in its place.

Professor Hummel and Mr. C. H. Bothamley also spoke, and in reply,

Mr. Green stated that as yet he had not succeeded in getting an absolutely white background, but he believed that it would ultimately be obtained.

Permanency of Colours

In the same Section, Professor J. J. Hummel, of the Yorkshire College, concluded a paper on "Fast and Fugitive Dye Stuffs" with the following words:—"I do not forget that many people abhor excessively bright colours, and the much-maligned aniline dyes are considered on this account most unworthy of our attention; they jar on the æsthetic taste, they are crude and inartistic. No doubt this is perfectly true, when they are used singly, and are inharmoniously arranged; but, given a good range of brilliant colours, it becomes possible, by their varied combination, to produce the most thoroughly pleasing and attractive shades of greys, and olives, and browns, and the thousand and one delicate tints beloved by the artist, and they yield, when desired, such as possess a richness and life and body of colour, compared with which the older colours are poor and lifeless. Let the artist, inexperienced perchance in the application and proper use of coal-tar colours, confine his attention if he wishes to the more sombre and older dye-stuffs, but do not allow him to persuade you that there is neither beauty nor permanence, or other quality of excellence, in any of the coal-tar colours of to-day. Employ them aright, with discretion, with intelligence, and they will not fail to recommend themselves to your better judgment. Rather than describe their discovery as useless, even from an artistic point of view, I would say, all honour to the founder of the coal-tar colour industry. If, in the beginning, he gave us the fugitive mauve, did he not afterwards labour hard and successfully in the cause of the fast artificial alizarin? All honour, then, I say, to Dr. Perkin, who has been instrumental in giving to the world not only fugitive but fast coal-tar colours."

A short discussion followed, in the course of which

Professor Hartley (Dublin) observed that as the result of experiments he had made he had come to the conclusion that they might expect water-colour drawings to last 400 years, provided they were protected from the influence of direct sunlight. Indigo was sometimes considered a fugitive colour, but whether it was or not depended very much on the nature of the indigo and on the drawing-paper. Even the best drawing-paper was invariably acid, and a wash of indigo on such paper was bound to be affected by the acid.

Coal-fields in South-East England.

In the section of Geology, Prof. A. H. Green, F.R.S., presiding,

Mr. W. Topley, F.R.S., read a paper by Mr. W. Whitaker, entitled "Suggestions on Sites for Coal Search in the South-East of England." In the course of some prefatory remarks he explained that as the result of our knowledge acquired in late years it was known that the beds were thick in the south of Kent and in Sussex, and that a great depth would have to be gone to in order to reach the mineral. If they sank near the North Downs, or to the north of that, the beds would probably be found to be thin, and the coal, if present, would be reached at a much less depth. The paper set forth that the general question of the rise of older rocks beneath the cretaceous beds of South-eastern England was now so familiar to geologists that there was no need to discuss it, but the practical application of their knowledge of the subject was in its infancy. Having regard to the great expense of making the deep trial-borings that would be needed in the search for coal, it was clearly well, as far as possible, to select sites where a good amount of work had been already done. The object of this paper was to point out that there were such sites, and that they were favourably placed for the search. Sites were then noticed, beginning at the south-east, near the only place where coal had yet been proved in the large tract in question, and working thence westward and northward.

Professor McKenny Hughes commented on the actual direction and amount of the dip of the Devonian and Silurian rocks discovered in the borings north of London having been ascertained, and argued that the coal basins would be found on the dip side of these points. Geologists had been formerly accurate, and they now asked the confidence of the public with regard to the existence of south-eastern

coal measures. There was the æsthetic question; but if by the development of these fields the solution of the smoke question was forced to completion, the present work would greatly benefit the country. But wherever there were coal seams they must have the long chimney, since the progress of civilisation could not be stopped. If landowners could be induced to co-operate and to agree upon borings in a reasonable and systematic way, the disfigurement of a large area might be saved, while a new industry could be introduced, and trade in that part of the country resuscitated.

Mr. W. A. E. Ussher and Mr. De Rance combatted Professor Hughes's views, Mr. De Rance remarking that it by no means followed that the coal measures lay conformably upon the more ancient Palæozoic rocks, which might have been turned on end and eroded before the more level coal measures were deposited on the upturned edges. Therefore the dip of the more ancient rocks would be no clue to the position of the overlying coal measures. The borings at Burford, to the west of Oxford, showed coal measures in the secondary rocks.

Ordnance Survey Maps.

In the Geographical Section, on the 9th inst., Mr. Henry T. Crook read a paper on "The Present State of the Ordnance Survey, and the paramount necessity for a thorough revision." He said that it was strange that, when the need for accurate maps was daily increasing, there should be a falling off in the sale of the national maps, for the making of which the nation had paid an enormous sum. This was mainly attributable to the fact that the maps did not meet popular requirements. The Ordnance Survey Department had undertaken more than it had the means to carry out in any reasonable time. The Survey had suffered severely from constant Parliamentary interference; and the result was that after more than a century's existence the Department had not completed one of its works. It had not yet produced on any scale a uniform map of the British Isles. Besides other disadvantages, the important question of price affected the sale of the ordnance maps. An outlay of at least 7s. 6d. was necessary to procure the ordnance sheets of a district in handy portable form. Of the whole of the southern counties of England no satisfactory topographical map existed, and for the remainder of England and Wales the utility of the existing maps was destroyed by antiquity. The system of agency monopoly greatly restricted the circulation of the maps, and prevented the public at large from obtaining them readily. The establishment of a revision department was absolutely necessary, which could only be done by increasing the proportion of the annual grant devoted to revision. This would not be done unless strong representations were made to the Government. Mr. Crook then read to the section the following letter from Sir Charles Wilson, Director-General of the Ordnance Survey:—

"The Ordnance Survey Department cannot be held responsible for the obsolete character of many of the maps, or for the system under which they are now sold to the public. No one can be more sensible than the Director of the Survey of the pressing need of a revision of the maps; but the question is really one of money, which it is for Parliament, and not for the Department, to decide. I think you under-estimate the pressure which has from time to time been brought to bear upon the Government to complete the 25-in. survey of Great Britain; and however much we may regret it, we can scarcely be surprised that the survey was pushed forward at the expense of revision. The result is that in many places revision must now be virtually a re-survey. The present system under which Ordnance Survey maps are sold by sole agents for England and Wales, Scotland, and Ireland respectively, was adopted, as you remark, contrary to the advice of the Director of the Survey. Mr. Chaplin, however, under whom the survey now is, stated, in reply to Mr. Webb, last session, that 'when a favourable opportunity occurred a change in the system would be carefully considered.' I believe that under a proper system the sale of the maps would be enormously increased. I must point out one or two errors in your generally accurate paper. The 6-in. map of the kingdom was completed in March last; that of Ireland has long been completed, and officially recognised as the basis for all dealings in land and for valuations for local assessment. About one-half of the 6-in. map of Ireland has been revised to date on that scale. Until recent legislation with regard to land in Ireland, the 6-in. map was considered large enough for all practical purposes by those who used it, and the necessity for a 25-in. survey has only been felt during the last few years."

Sir Douglas Galton said it would be well if the British Association could be induced to address the Government on the subject, in order that the whole question of the position of the Survey, and of the sale of the maps, might be thoroughly agitated and discussed, especially now that they had transferred the Survey from the Office of Works to the Board of Agriculture, where no doubt Mr. Chaplin would be most anxious to do everything he could to promote the welfare of those who wanted maps,—the farmer being one of those who was most urgently in need of them. He therefore strongly urged the section to pass some resolution on the subject. Perhaps the Council might be requested to consider the question during the recess, so that some strong representations to the Government might be made. They were all very much indebted to Mr. Crook for having brought the subject forward.

After some further discussion, on the motion of Sir Douglas Galton, it was resolved that the Council should be requested to consider the matter in the recess, and that strong representations should be made to the Government on the subject.

Measurement of Elongation of Test Samples.

In the Mechanical Science Section, Mr. J. W. Wicksteed read a paper on "Measurement of Elongation in Test Samples." He stated that when a bar of metal is stretched with a longitudinal pull, it first extends generally throughout the whole of its free length, after which, especially in best iron, mild steel, and copper, it extends locally about the place of final fracture. The "general" extension continues so long as the bar offers increasing resistance to the pull, and from the end of that stage to final fracture the extension is local. The general extension is unaffected by the shape or proportions of the specimen, and may be correctly expressed in units of its own length. The local extension bears no relation to the length of the specimen, and should, therefore, be expressed in standard units of length. The usual engineering practice of the present day is to measure the total extension, and to express it in percentage of the original length of specimen; but this practice makes it difficult to draw correct comparisons of ductility between different experiments, unless the specimens have been all made to the same pattern. It also prevents the value of the material being discriminated as between capability for stricture and the capability for stretching without loss of strength. The author described a method for separating the measurement of the general extension from the local, and recommends a column in test reports of "per cent. general extension," leaving the present column of "per cent. contraction of area" to record the capacity for stricture, and the present column of total extension in inches, from which the local extension can be deduced by subtracting the recorded general extension from the total as measured after the sample is broken.

Next week we may notice briefly one or two other papers read before the Association.

AWARDS AT THE BRIGHTON HEALTH EXHIBITION.

THE preliminary list of awards at the Brighton Health Exhibition, of the contents of which we gave an account a fortnight ago, was made known on Friday last, but an official copy of the list has not reached us. We select (and correct) the following from the list as published in the *Sussex Daily News*:—

Medals.

Clemens, Abell, & Co., for street-sweeping machine.
W. H. Allen & Co., for sanitary publications.
London, Brighton, and South Coast Railway, for exhibit of railway rolling-stock and appliances.
J. Stott & Co., for mercurial gas governor.
G. M. Hammer & Co., for school furniture.
F. C. Calvert & Co., for carbolic acid preparations.
Washington Lyon, for steam disinfector.
Burmantofts Works, Leeds, for decorative pottery and faience; also for decorative glazed faience fireplaces.
Moule's Patent Earth Closet Company, for earth closets.
Joseph Cliff & Sons, for "Cecil" stop-sink; also for imperial porcelain bath.
J. Tylor & Sons, for "Ariston" stop-sink water-closet.
Hayward Bros. & Eckstein, for self-locking coal-plate; also for semi-prism reflecting pavement and roadway lights.
John Greenall, Portland-street, Manchester, for steam washer.

Certificates.

Merryweather & Son, for armoured india-rubber hose.
Sanitary and Domestic Engineering Company, for gradient indicating block.
Thomas James Moss Flower, for adjustable clinometer; also for Watts' asphyriator for testing drains.
C. Kite & Co., for wall inlet ventilator.
Brighton Waterworks, for Baber's water hydrant.
Clemens, Abell, & Co., for improved chain-pump; also for street watering-van.
Joseph Cliff & Sons, for white enamelled fire-clay sink; also for Winser's channel bends; also for Stoke's gully; also for Beancliff disconnecting trap
J. Tylor & Sons, for lavatory basins and fittings; also for weir overflow valve water-closet for lead trap; also for "Column" water-closet.
Bostel Bros., for lavatories.
John Smeaton, Son, & Co., for Imperial spray bath; also for excelsior dust-shoot.
Burn & Baillie, for combination bath; also for hinged grating for overflow of bath; also for lavatory with overflow which can be cleansed; also for improved urinal; also for cast-iron drain-pipes, inspection chamber, and trap; also for brass traps for baths and sinks; also for indiarubber expanding plug for drain-testing.
Doulton & Co., for special urinal.
Bostel Bros., for collar-joint for connection of soil-pipe to water-closet.
D. T. Bostel, for union-joint for connection of soil-pipe to water-closet.
Imperial Smoke Consumer Company, for boiler covering bricks.
J. Haines, for china slop-pail.
Edward Wyborn, for case showing the relative constituents of various milks.
The Morris Tube Ammunition Company, for circular arrangement for filters.
T. H. Durrans & Son, for metallic-jointed man-hole cover.
Wire-Wove Roofing Company, for wire-wove roofing.
George Hammer & Co., for church fittings.
H. Heim, for cast and sheet iron ventilating gratings, with Louvre valves; also for round ventilating valves.
Hayward Bros. & Eckstein, for mica-flap outlet ventilator with "hit and miss" front; also for ornamental "hit and miss" air bricks; also for "The Southwark universal Venetian ventilator."
Smith, Collier, & Co., for Venetian blind fittings.
Beves & Co., for wood mouldings.
Henry Cresswell, for decorative tiles and pottery.
J. Haines, for artistic pottery and porcelain.
Eagle Range Foundry Company, for Eagle grate.
C. G. Reed & Son, for stoves, mantelpieces, and brasswork.
Peters, Bartsch, & Co., for chemical heat retainers.

Illustrations.

COMPETITION DESIGNS FOR PARLIAMENT HOUSES, ROME.

THE two designs here illustrated were among the premiated designs in this important competition for a grand Parliament House for Rome, which was decided early in the present year, but which, like some large competitions nearer home, proved an abortive affair, the committee appointed to consider the designs declining to recommend any one of them for execution, though bestowing premiums on several. There is a dignified character about the two which we illustrate, by Signor Moretti and by Signori Broggi & Sommaruga, which renders them worth illustrating as designs, though they are not destined to enter into the stage of execution.

Forty-nine designs were submitted, from among which eight only were selected for serious consideration. Of these, the designs by Signori Broggi & Sommaruga, Moretti, Quaglia-Benvenuti, Ristori, and Basile, received each a premium of 5,000 francs; and those by Signori Giampietri, Manfredi, and Magni, received each an honourable mention and a premium of 3,000 francs.

Signor Moretti's design, of which we give the principal elevation, was generally regarded as architecturally the best. The three domes, which mark the three main internal divisions of the building, are obviously to a certain extent inspired by the style and treatment of the Pantheon dome. The design by Signori Broggi & Sommaruga was generally regarded as next in merit. We give the plan of this, which is a fine one in some respects, but the principal central feature is very ponderous in effect. Both designs may be of interest, however, as examples of modern Renaissance design by architects of the land of the Renaissance.

MONUMENTAL BRASSES.

THE two brasses which form the subject of our illustrations are declared by many good authorities to be the two finest examples which exist in England at this present time. A few brasses in England present quite a different appearance to the majority; they are for the most part of a large size, and rectangular in shape; the background of them is filled in with elaborate canopy and diaper work. They are of foreign workmanship. To this class Abbot Thomas Delamere, at St. Albans, belongs. The majority are let into stone casements or matrices, of a shape corresponding to the figure, as in that of Sir Robert de Bures, Acton, Suffolk. This is one of the few early fourteenth century cross-legged knights. A full description of it is given in Waller's series of Monumental Brasses.

For the benefit of those especially interested in brasses I may mention that there is now at Cambridge an Association of Brass Collectors (shortly called "C.U.A.B.C."); the correspond-

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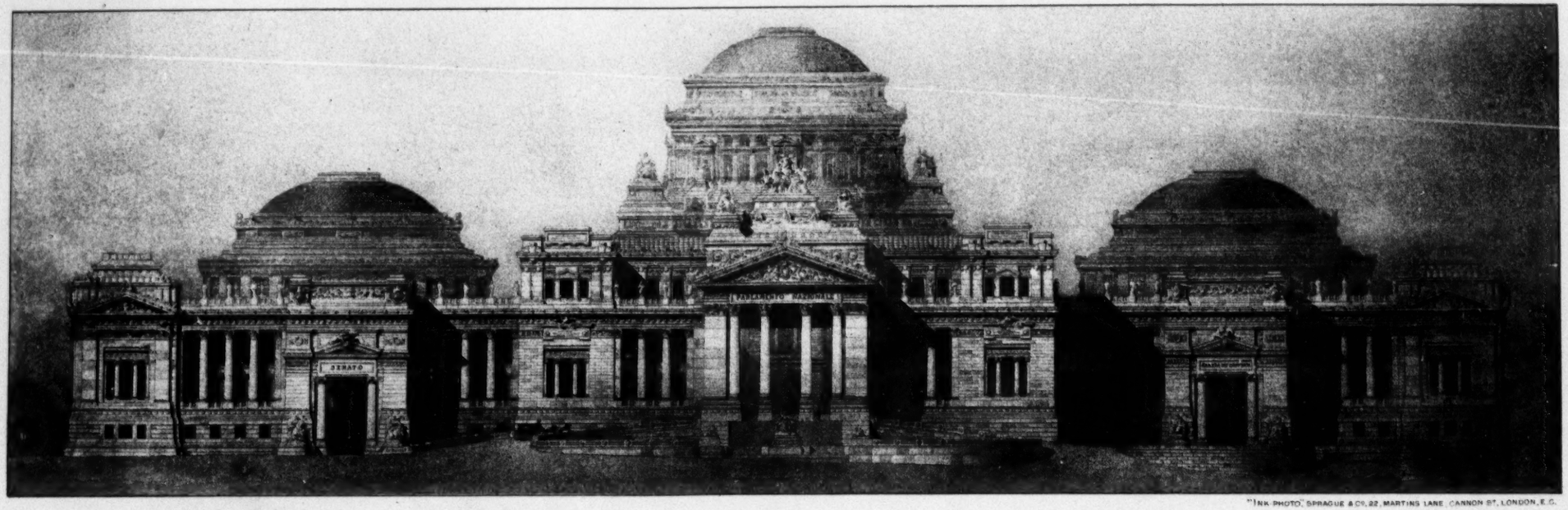

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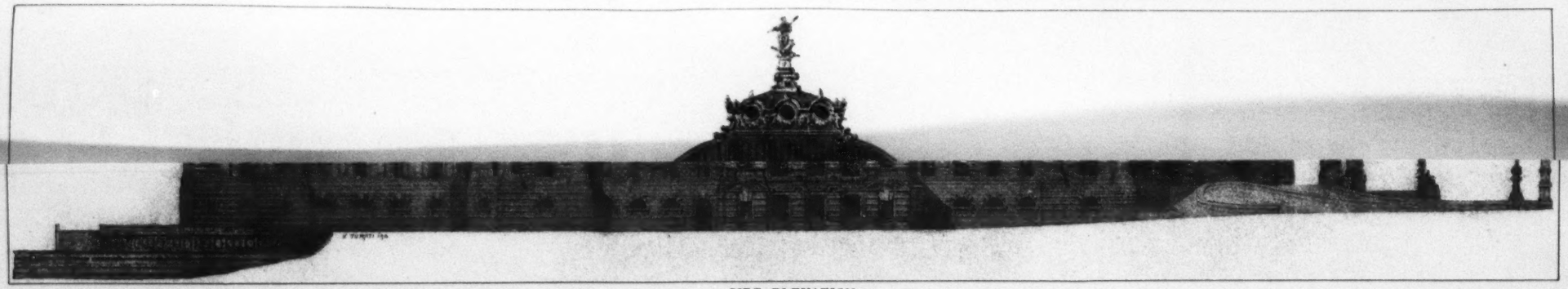
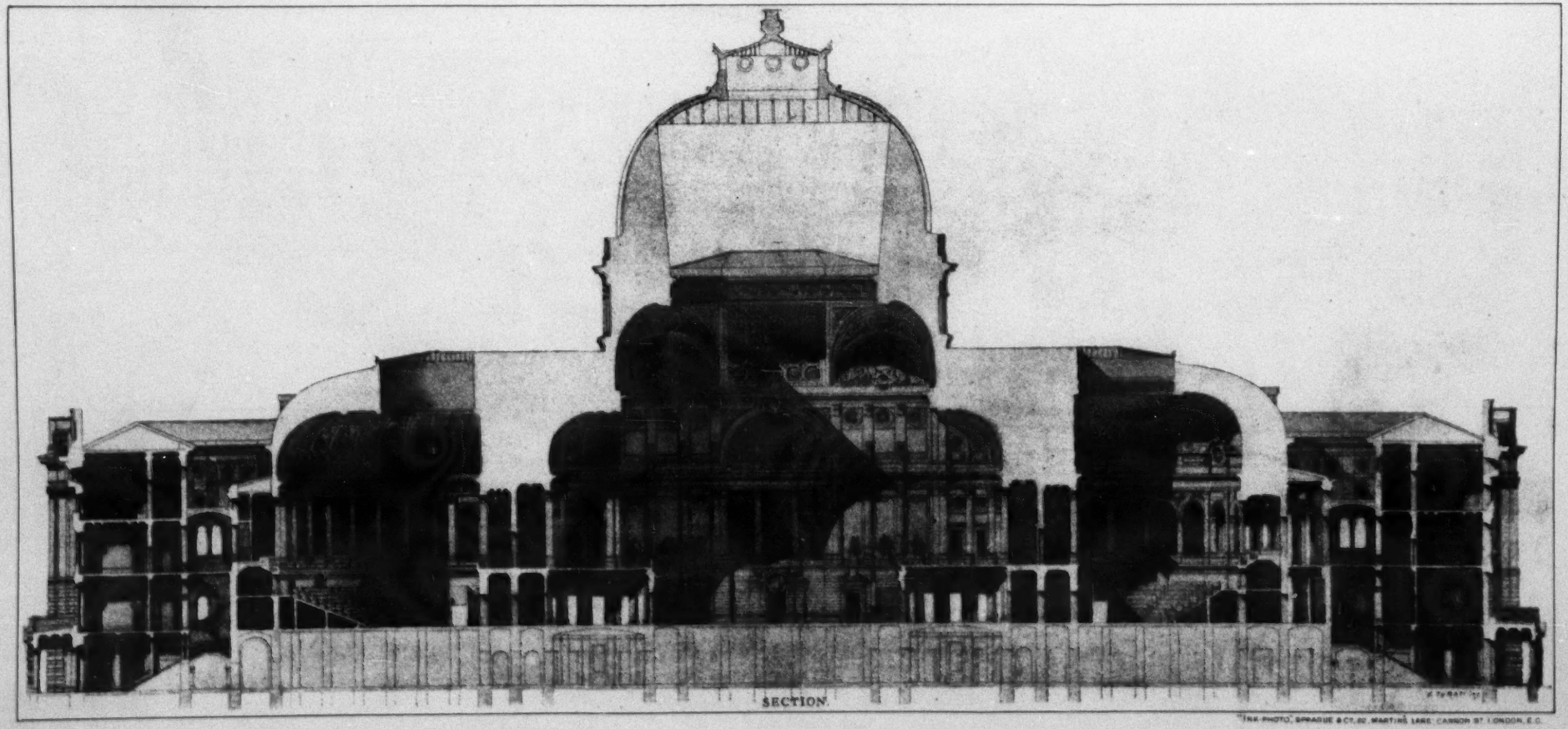
COMPETITION DESIGN FOR PARLIAMENT HOUSES, ROME.—SIGNOR MORETTI, ARCHITECT.

PRINCIPAL ELEVATION.



SIDE ELEVATION.



SECTION.

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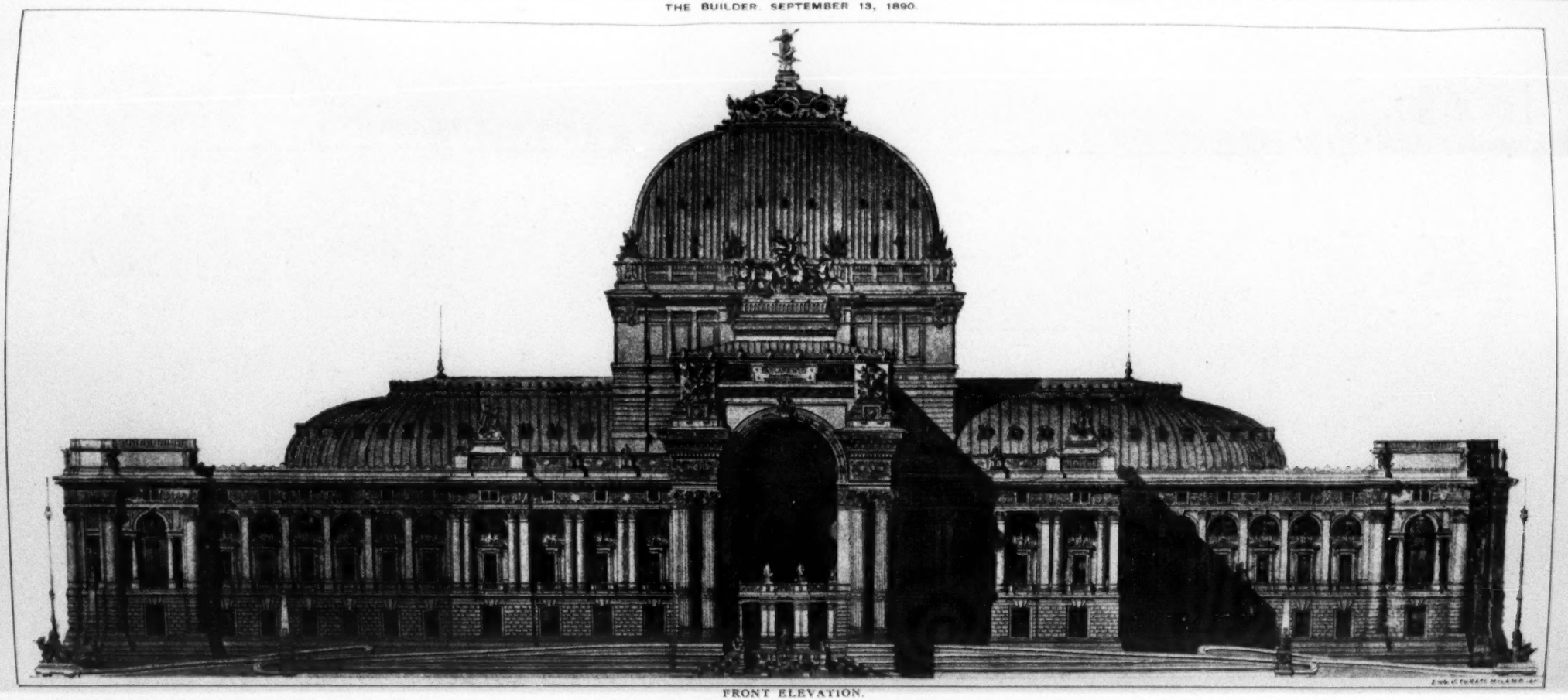
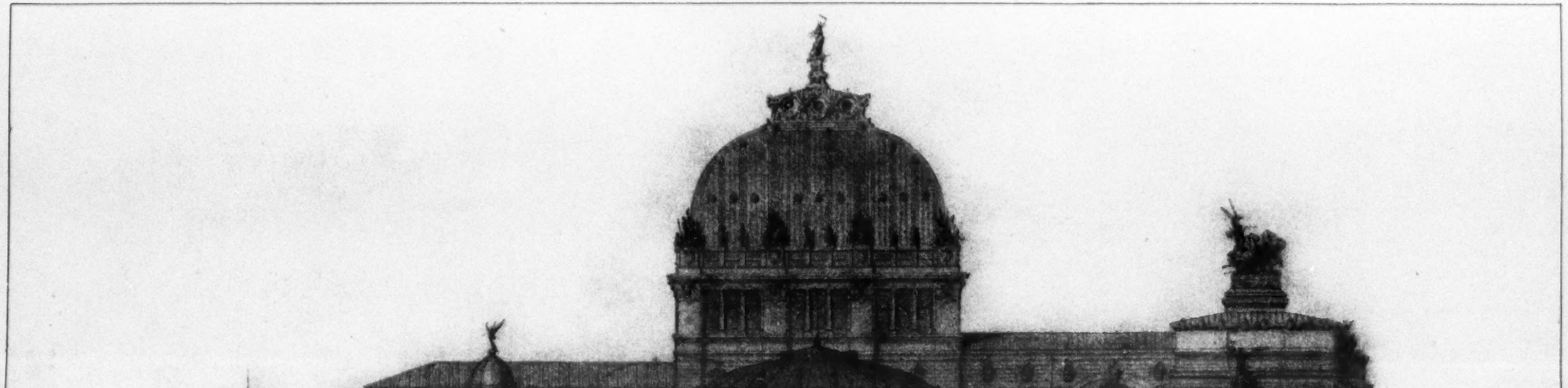
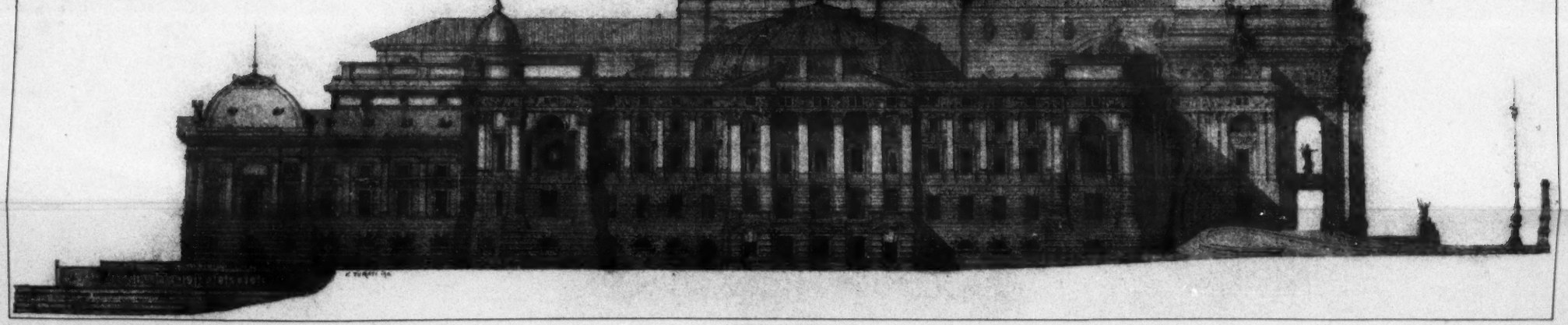
COMPETITION DESIGN FOR PARLIAMENT HOUSES, ROME.—Signori L. Broggi and G. Sommaruga, Architects.



FRONT ELEVATION.





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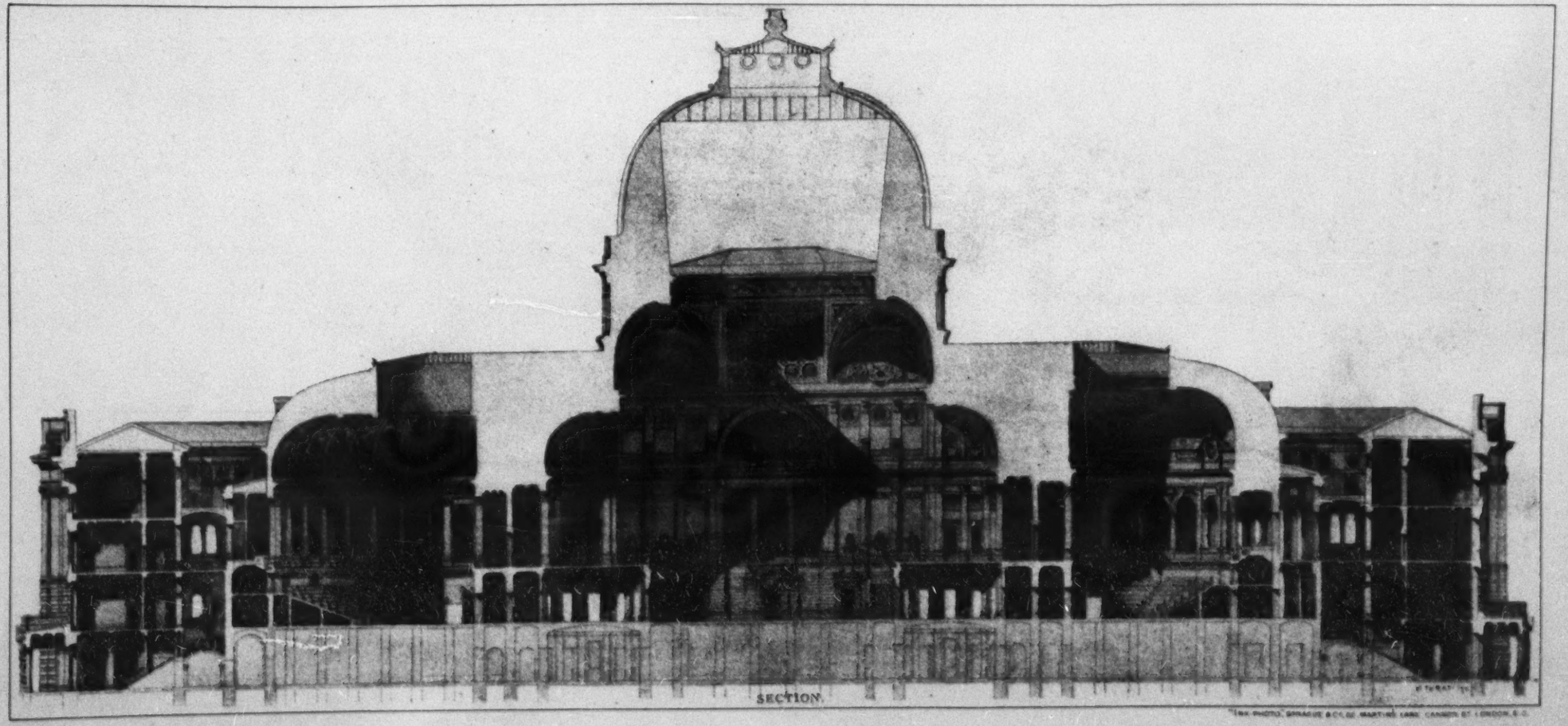
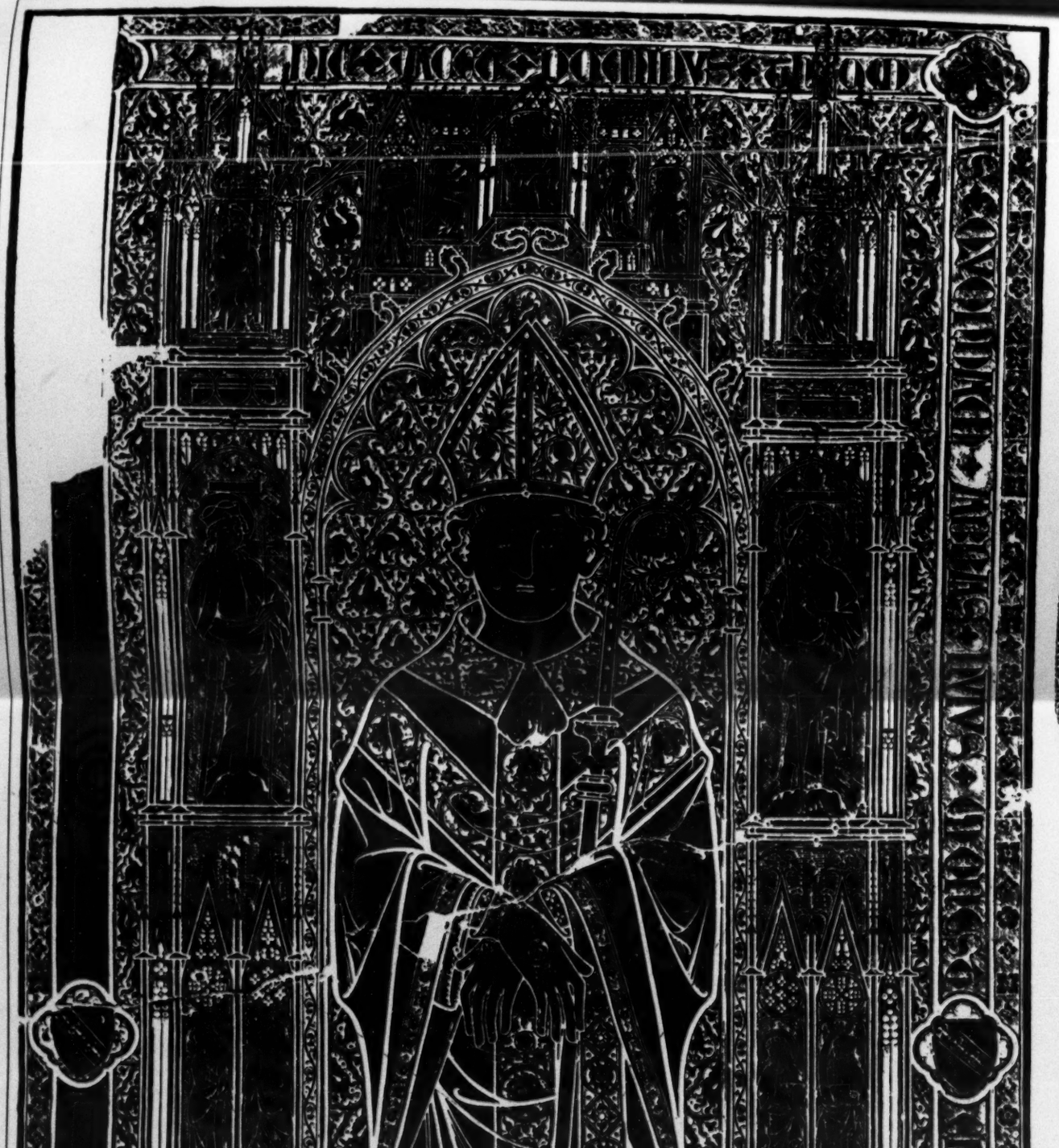
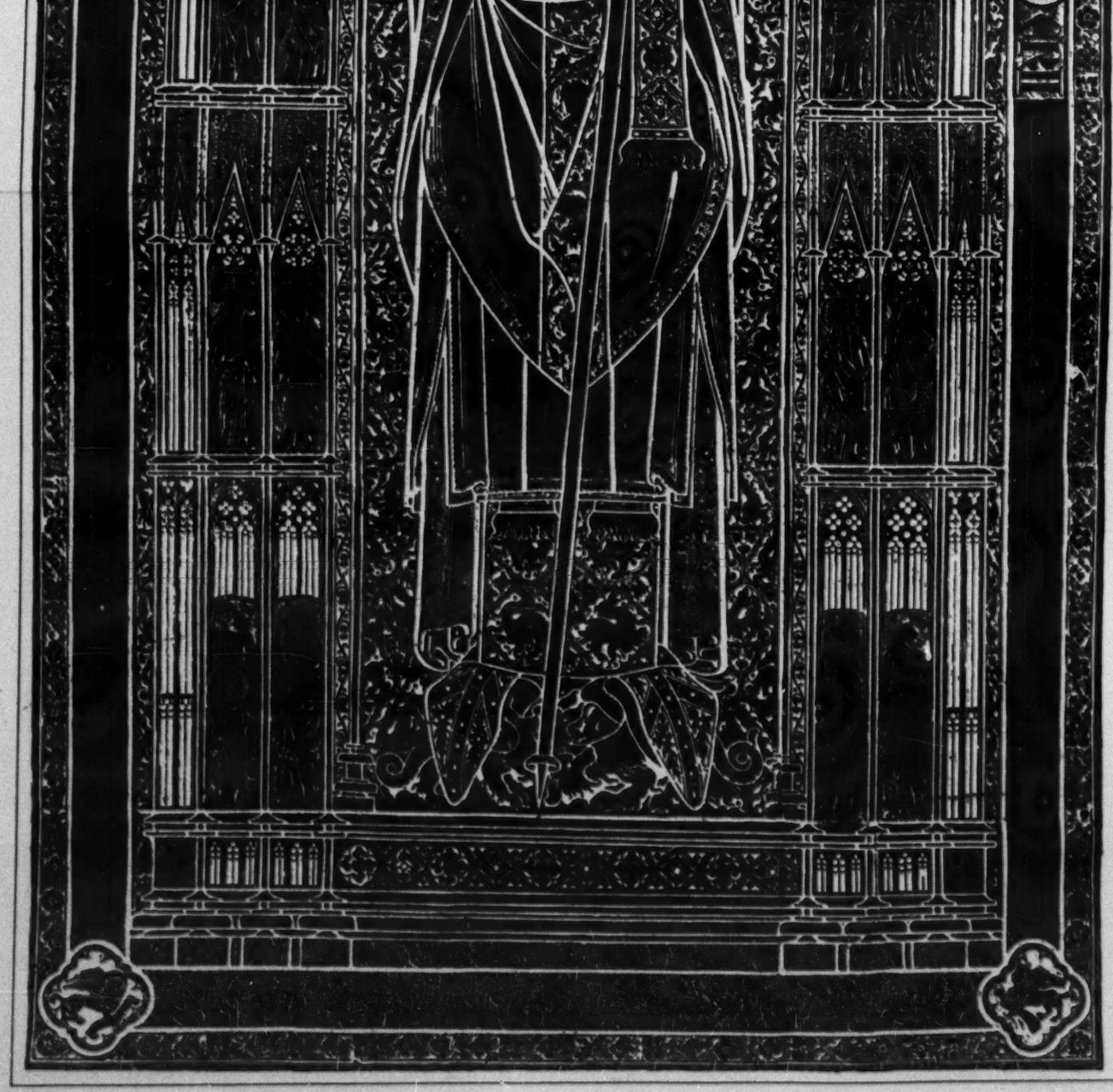


SECTION.

COMPETITION DESIGN FOR PARLIAMENT HOUSES, ROME.—Signori L. Broggi and G. Sommaruga, Architects.





BRASS OF ABBOT THOMAS DELAMERE; ST. ALBANS, HERTS. (*Circa*, 1360—1370).

SIZE OF ORIGINAL: 9-FT. 3-IN. × 4-FT. 4-IN.

BRASS OF SIR ROBERT DE BURES; ACTON, SUFFOLK. (1302).

SIZE OF ORIGINAL: 6-FT. 6½-IN. × 1-FT. 8-IN.

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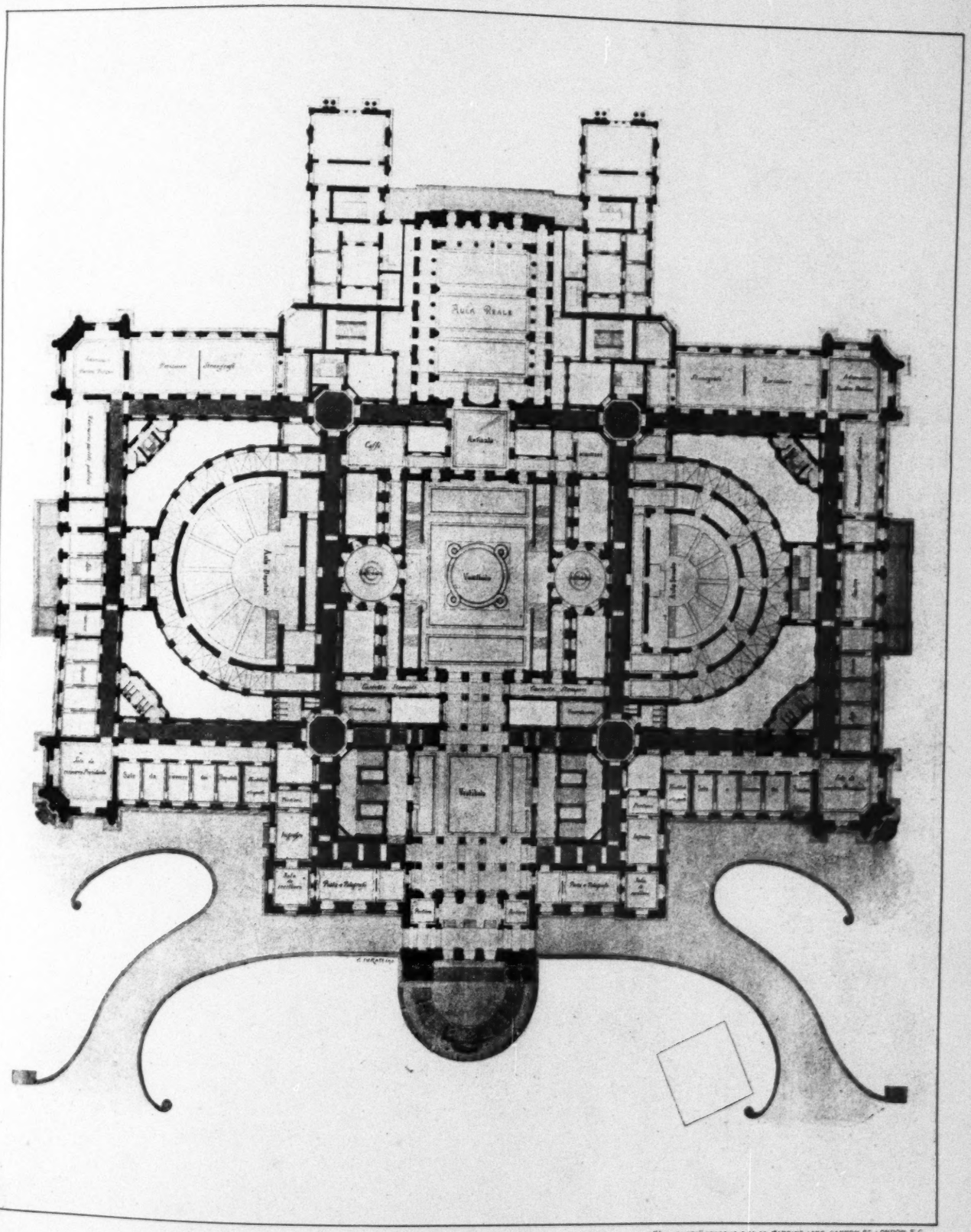
FROM RUBBINGS BY MR. E. M. BELOE, JUNR.



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COMPETITION DESIGN FOR PARLIAMENT HOUSES, ROME.—Signori L. Broggi and G. Sommaruga, Architects.

GROUND PLAN.

The Hospital Chapel, Ilford, Essex.

Interior View Looking West.

The Chapel from Dr. Schimeli's Garden.

Mr. J. Martin Brooks Architect. A.R.I.B.A. 33 Wellington St. Strand

PHOTO-LITHO SPRAGUE & CO. 62 MARTINS LANE CANNON ST. LONDON, E.C.

ing secretary is Mr. R. W. M. Lewis, of Corpus Christi College. The subscription is merely nominal, the snm of 5s. conferring life membership on those who wish to join. All the latest "brass news" is published in their papers, which also contain a very useful exchange column; by this means members living in distant parts may exchange their rubbings.

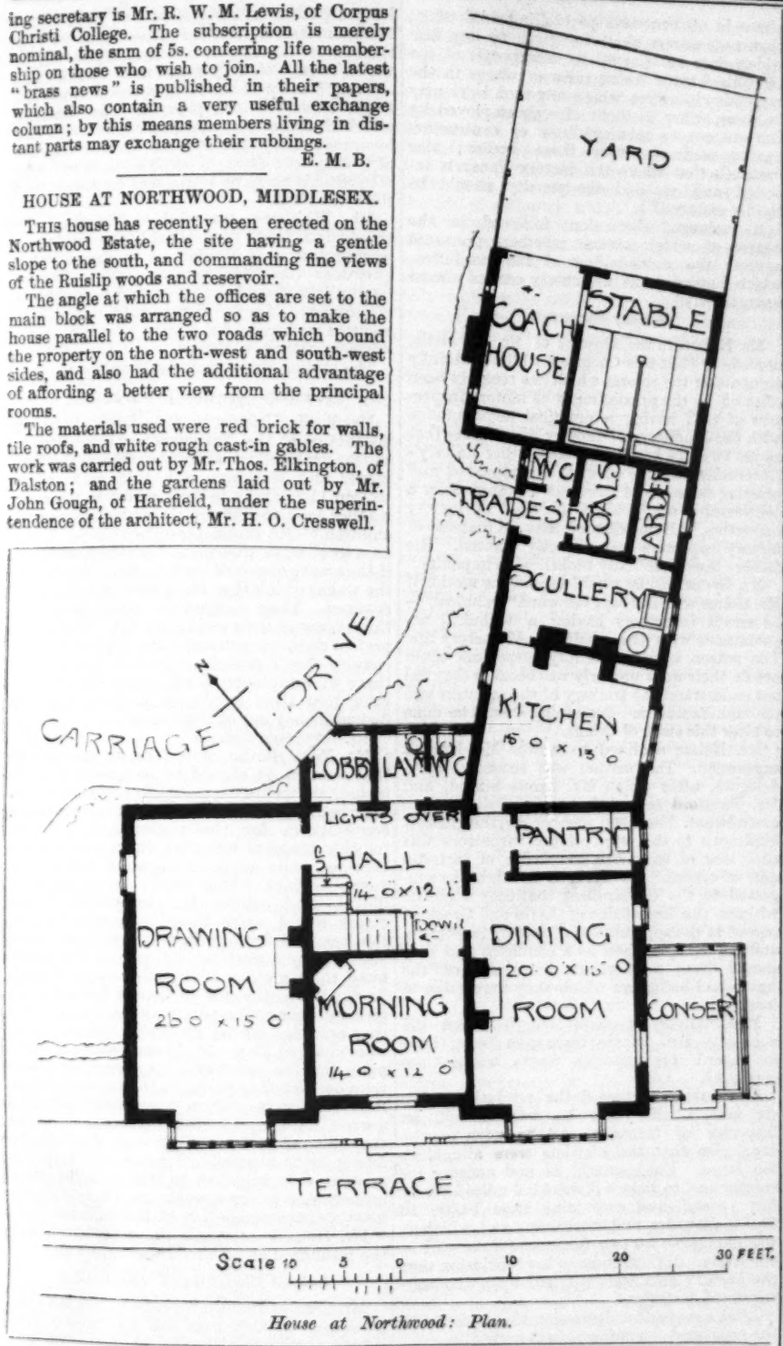
E. M. B.

HOUSE AT NORTHWOOD, MIDDLESEX.

THIS house has recently been erected on the Northwood Estate, the site having a gentle slope to the south, and commanding fine views of the Ruislip woods and reservoir.

The angle at which the offices are set to the main block was arranged so as to make the house parallel to the two roads which bound the property on the north-west and south-west sides, and also had the additional advantage of affording a better view from the principal rooms.

The materials used were red brick for walls, tile roofs, and white rough cast-in gables. The work was carried out by Mr. Thos. Elkington, of Dalston; and the gardens laid out by Mr. John Gough, of Harefield, under the superintendence of the architect, Mr. H. O. Cresswell.



House at Northwood: Plan.

HOSPITAL CHAPEL, ILFORD.

THE ancient chapel, dedicated to St. Mary and St. Thomas of Canterbury, was founded by Adeliza, Abbess of Barking, in the reign of Stephen; and had a prior, chaplain, and thirteen poor brethren, who were lepers. It was endowed with the tithes of Barking parish, and strict statutes for it were drawn up by the Bishop of London in 1346. At the Reformation its revenues were valued at 16*l.* annually. Queen Elizabeth granted these tithes and the site to the Fanshawes upon the condition that it was maintained as an almshouse for six poor men, with a chaplain to perform Divine service in the chapel.

The estate is now vested in the Marquis of Salisbury, who is master of this semi-ecclesiastical establishment, and pays the yearly stipends. The chapel dates from the fifteenth century, and prior to the recent alterations was a long narrow building, 74 ft. in length, by 16 ft. wide; it was the only place of worship for the inhabitants of Great Ilford until the erection, in 1830, of the parish church. Recently the church had fallen into a bad state of repair, the walls being 6 in. out of the perpendicular. A deep classic moulded cornice was erected about 1740; in the restoration this was found to be 2 ft. above the old wall-plate level, which was nearly all destroyed. The wall-plate now is at the original level. The face of rafters was plastered; this has been all taken off, and the face boarded with ribs nailed on at various intervals. The division of chancel is formed by ribs and cusping. The chapel is now 92 ft. long inside the walls. The south wall has been partly knocked out, and five bays formed, and a small one at the west end, this being the entrance to the baptistry. The windows in the south side were in a bad state of repair, the stone works being made up with cement and tiles. These have all been carefully restored, and three new windows inserted, and one in the westward of new aisle. A new Rose window has been inserted in the west-end of the nave, with a doorway under it. The new aisle is 10 ft. 6 in. wide, and runs the whole length of the building; at the interior end are two vestries, these are connected with a new cloister from the chaplain's-house to the chapel. A chapel is being formed at the east end of the aisle, which is fitted up with a baldachino, the drapery and embroidery of which is being made by Messrs. Morris & Co., of Oxford-street, who are about also to put some stained-glass windows in the chapel. Two new iron screens are being made, one for the chancel and one for the Lady chapel; the choir stalls are in progress—these are being made in Indian teak. Mr. Watson, of Ilford, was the builder, Mr. J. Martin Brooks being the architect for the restoration.

FROM AUSTRALIA.

COLONIAL ARCHITECT'S DEPARTMENT, NEW SOUTH WALES.

FOR many years the architectural work of the Government of New South Wales has been carried out by an official known as the Colonial Architect, and a large staff under his command. The work of the Department consists of public buildings of all kinds throughout the colony, from the little bush lock-up on the mountains or troopers' quarters in the far west, to imposing stone edifices, such as the Post-office, the Lands Office, or the Colonial Secretary's Offices. Court Houses, Gaols, District Post and Telegraph Offices and Lands Offices, and all other public buildings, with the exception of schools, have been carried out and also kept in repair by the Colonial Architect's Department, and its duties are so extensive as even to include the supply of coffins for the pauper inmates of the various benevolent asylums. To administer such a Department successfully is no mean task, and this has been done by the late Colonial Architect, Mr. James Barnet, F.R.I.B.A., who has just retired after thirty years' service. Most of the best work of the country was thus in the hands of one man, and it has long been a grievance with the profession in Sydney that such should be the case. Advantage has, therefore, been taken of this opportunity to re-organise the Department, and henceforth it is stated that all Government works of over 5,000*l.* in value will be thrown open to public competition under conditions yet to be settled. The carrying out of those under 5,000*l.* in value, and the maintenance of existing buildings, of which there are a large number, will be the duty of the new "Supervising Architect," as he is to be called, and Mr. Walter Liberty Vernon, F.R.I.B.A., has just been appointed to the post. No better choice could possibly have been made by the Government. Mr. Vernon is a gentleman in the prime of life, of robust physique, urbane manners, considerable professional skill, and the strictest integrity. He practised in London and Brighton until the year 1883, when he removed to Sydney in order to obtain a more favourable climate than that of England, and with the happiest results. His work here has comprised several large and important buildings and many smaller ones, and for part of the time he has been in partnership with Mr. W. W. Wardell, F.R.I.B.A., the *doyen* of the profession in Sydney. During the last three years, since Mr. Wardell's resignation, he has acted as one of the hon. secs. for the Royal Institute of British Architects in Australia.

Whether the new scheme of competition for Government work will work out satisfactorily has yet to be proved. Judging by recent information to hand from the old country it has been thought that the system of competition for large Government works has not been found altogether desirable, and that a reversion is likely to be made to the older and safer method of appointing an architect of tried skill and knowledge for each important building. At any rate the forthcoming competitions will afford employment to the many architects and assistants in Sydney who at the present time have practically nothing to do, but the spoils will fall to the few. The usual result will follow, that work of greater value will be done by the competitors in the shape of drawings than the successful architect will receive in the way of commission.

GLASGOW ARCHITECTURAL ASSOCIATION.—The usual monthly meeting of this Association was held on Tuesday, the 2nd inst. After the usual business had been disposed of, Mr. Fairweather read a paper on "The Early Period of Greek Architecture," being the first of a series of three on Greek architecture, the next being "The Middle Period," and the third "The Late Period." The essayist went over the history of early Greece, beginning at 1856 B.C., when Inachus, a Phœnician adventurer, arrived in Greece at the head of a small band of his countrymen. After giving an account of the tomb of Atreus at Mycenæ, Mr. Fairweather passed in review most of the buildings of the period now remaining. Mr. Potts opened the discussion, at the close of which Mr. Fairweather was awarded a very hearty vote of thanks for his interesting paper.

THE TRADE UNION CONGRESS.*

ON the third day of the Congress, there was a renewal of the lively scenes to which we made reference last week. But without entering into a narration of the causes of these exciting interludes, we append a few notes as to some of the resolutions arrived at by the Congress.

Factory and Workshop Disciplinary Fines.

Mr. W. J. Davis moved—"That this Congress is of opinion that factory and workshop disciplinary fines should be made illegal; and that the Parliamentary Committee be and is hereby instructed to urge the Legislature to adopt such amendments to the Truck Acts of 1831 and 1887 as shall make such practices a contravention of the said Acts." This was seconded and almost unanimously adopted, after being amended by adding words to it suggesting that all fines whatsoever should be made illegal.

Public Contracts and Fair Wages.

Mr. Shipton moved,—"That this Congress instructs the Parliamentary Committtee to take such steps as they may deem most effective to secure at the earliest moment, in all Government work and municipalities, the full payment of the current rates of wages recognised by the organised industries of the United Kingdom." He said that the Government system in vogue at present was to let the contract at the lowest possible price. The consequence was that the firm who had the contract was avoided by all good, skilled workmen, and the whole system was one of degradation to labour and subservience of efficient workmanship, resulting in pernicious scamping in Government work.

This having been seconded by Mr. T. Shaw,

Mr. C. Matkin said he thought the resolution hardly strong enough. He moved as a prefix to the original motion:—"That this Congress considers the system of contracting by schedule, adopted by the Government as a means to the employment of cheap labour, and consequently the lowering of wages below the standard rates of wages of the district, is detrimental to the prime interests of the community; and also is of opinion that a clause should be inserted in all contracts prohibiting sub-letting and piecework, and that no contract be accepted from any firm that does not pay the recognised rate of wages of the trade affected in the town or district where such work is being done; and further, the Congress pledges itself to oppose all candidates for Parliament, municipalities, or other local bodies, who do not pledge themselves to do all in their power to support the above resolution." He believed the Congress should lay down a policy for the Parliamentary Committee during the next twelve months, if they expected anything to be done.

The amendment was accepted by Mr. Shipton.

Mr. Corbett proposed to further amend the resolution by adding after "municipalities" the words "and all contracts for the same."

Mr. Weighill supported the resolution.

Mr. John Burns expressed the opinion that Mr. Shipton's resolution went as far as the majority of trade unionists wished to go. It would improve matters slightly, but not to the extent that would justify the Congress in passing it in its present form. He exemplified his contention by saying that the London compositors were themselves protected entirely by the phrase "fair wages," which meant for the compositors trade union rates, but it did not mean so in those of bricklayers, stonemasons, and the like. In these trades there was much harm done by sub-letters and sub-contractors searching all over England for pace-workmen, whom they paid 1d. to 1½d. an hour above the ordinary wages, to keep up the pace which others were compelled to follow. He was against "fair wages," and in favour of trade union rates.

After a great deal more discussion, the resolution was temporarily withdrawn in order that it might be re-modelled so as to include cases which were not within its scope as originally drawn.

Subsequently Mr. Shipton read the resolution as re-drafted. It was as follows:—"That this Congress condemns the system of contract by schedule adopted by the Government and other public bodies, as it conduces to low wages, scamped work, and inferior materials, which are pernicious to the public interest. The Parliamentary Committee is hereby instructed to take such steps as may be most effective to secure the insertion of a clause in all contracts prohibiting sub-letting; that no contract shall be given to any firm which does not pay all its workpeople at the recognised trade union rates of wages in the respective localities where any such work may be done, either by those directly employed by Government or municipalities or contractors having contracts from these bodies; also demands that where the factory clause is inserted and violated the penalty should be rigidly enforced."

A prolonged discussion followed, in the course of which several members protested against the re-modelling of the resolution, which, however, was ultimately carried almost unanimously.

Factory Inspectors.

Mr. Holme, in the absence of Mr. Birtwistle, moved,—"That this Congress, whilst gratefully recognising the reform which has recently been effected by the appointment as factory inspectors of men having a practical acquaintance with the conditions of factory life, regrets that as yet no steps have been taken by her Majesty's Government to give effect to the repeated and pressing demands of previous Congresses for a considerable addition to the staff of factory inspectors." He contended that an increase of factory inspectors was urgently wanted. The factory laws were daily broken with impunity.

Mr. Lyons said he would second the motion if Mr. Holme would accept the word "technical"—he meant inspectors having a technical acquaintance with the conditions of factory life. The reason why the factory inspectors could not do their work properly was because they did not understand the trickery of the sweaters and the manufacturers. Something should be done to alter this state of things.

Mr. Holme declined to accept Mr. Lyons's suggestion. The motion was seconded by a delegate, after which Mr. Lyons moved, and Mr. Bradford seconded, the suggestion as an amendment. The latter speaker said the greatest hindrance to the work of the inspectors was their lack of technical knowledge of factories and of trades. He thought it might be suggested to the Government that they might do without the knowledge of Latin and Greek in regard to the appointment of factory inspectors, and impose upon them as a condition that they should have a thorough knowledge of the trades and industries which they were going to inspect.

Miss Whyte at some length urged the necessity for female inspectors being tried in regard to factories where women are employed.

Mr. Davies supported the resolution. For six and a-half years he was himself an inspector of factories, and he came to the conclusion that the districts were altogether too large. For instance, he and another inspector had to work a district 100 miles long by forty broad, and containing from 10,000 to 14,000 factories and workshops, and which it was impossible for two inspectors to attend to efficiently. He had come to the conclusion that the Factory Acts were a fraud upon the best-regulated factories.

After some further discussion, the motion, with the suggested amendment, was agreed to.

The Qualification of Engineers.

Mr. J. Swift moved the following resolution:—"That this Congress regrets that no favourable opportunity presented itself during the past Session of Parliament to debate the Bill having for its object the future examination of persons in charge of steam engines or boilers, and the granting of certificates as to their practical fitness for such a duty. That the Parliamentary Committee be instructed to arrange for the re-introduction of this Bill next Session; and should any other Bill be introduced relating to steam engines or boilers, that an effort be made to have included the principle of examination and granting of certificates as to the practical fitness of all persons placed in charge of steam-engines or boilers." He said that for twelve or thirteen years a resolution had been adopted by the Congress in favour of the Bill making it compulsory that enginemen and boiler attendants should possess certificates of competency. Some time ago a Bill approving this principle was introduced in the House of Commons by Mr. Fenwick, and was rejected, but Mr. Fenwick was informed that if the Bill had not been of such an extreme nature, it would have received greater support. A new Bill had since been prepared, and they believed it would be acceptable to those who had opposed the former measure. He mentioned that in 1879 there were seventy-two boiler explosions, by which twenty-eight persons were killed. One striking feature of the returns was that not one single explosion took place on board steamers on which there were certified engineers. The insurance companies' returns showed that out of twenty-four cases of explosions, seven were attributable to pure negligence on the part of the attendants.

Mr. Whitburn seconded the motion. He considered that they should call on labour representatives in Parliament to demand that questions like this, involving the safety of human life, should be considered as questions of urgency. They did not want this Bill to create a monopoly, but simply to protect themselves as skilled workmen.

The motion was unanimously agreed to.

The Employer and Workman Act.

Mr. P. H. Holmes moved—"That it be an instruction to the Parliamentary Committee to endeavour to effect such a change in the Employer and Workman Act, 1875, as to cause section 11 to apply to male adults in the same manner as it does to female young persons and children." He urged that they should be put on a level with women and children, and that if they were unavoidably kept from their work, the wages which they had earned should not be retained. They claimed the same justice for themselves as their employers did. They had a perfect right to demand that the law of their country should give them perfect equality with those who employed them. They did not consider that their employers had any right to deduct money out of their wages.

Mr. Roy seconded.

Mr. Keir Hardie moved as an amendment that section 11 should be so extended as to include payments for materials necessary to the carrying on of the work and for the necessary conveniences for the workers. The reason for this proposal was that there were certain charges made, especially against women and young workers, which ought to be rendered illegal, and which the extension of the clause would make illegal. It was recently the law in a factory that each worker should pay a penny a week for the peg on which they hung their clothes whilst they were at work To-day it was the rule in certain factories that girls were charged a penny a week for the rooms they occupied whilst at work. Others, again, were charged 25 to 50 per cent. above the cost price for the materials they used, and they were compelled to purchase their materials from their employers. Others, again, paid threepence a week for keeping their workroom clean, and they themselves had to perform the work, the money being to provide brushes and soap. In another case reported to him, on indisputable authority, a penny a week was charged for the lavatory accommodation of the workers.

Mr. Holmes accepted the amendment, and the resolution as amended was agreed to.

Labour Disputes and Conciliation.

Mr. Charles Hobson moved—"That this Congress is of opinion that the formation of joint boards, composed equally of employers and workmen, is highly desirable, as being well calculated to result in a better understanding between them, and the settlement of vexed questions affecting the interests of both; and hereby urges the trades councils and other organised bodies of workmen to bring the subject before the chambers of commerce and other bodies of employers, with a view to the formation of such boards."

Mr. Stuart Uttley seconded. He said that, whatever might be said to the contrary, the great bodies of working men were those who should take up this matter of conciliation.

Mr. Davies strongly held the opinion that to adopt conciliation boards was to turn the clock of trade unionism backwards. He moved, as an amendment, "That, whilst believing in the utility of conciliation boards in settling labour disputes, and many of the labour problems of the day, we are of opinion that the best parties to compose such boards are those directly interested in such matters, either as workmen or employers, as the interference of outsiders would be met with resentment." The disputes should not be left to parsons and others, who know nothing about labour. If working men formed themselves into a strong union they could force up the price of labour simply by the force of trade unions.

Mr. Aston said that by binding themselves to-

* See p. 186, *ante*.

gether they would obtain their demands. Outside interference, he believed, caused resentment.

Mr. Wardley thought a third party should be called in before ill-feeling was engendered, and before there were great losses. He was strongly in favour of the resolution.

Mr. Bloor supported the resolution.

It was next moved and seconded that the question be now put. For the motion 123 hands were held up, and 59 against. The motion was declared carried.

The amendment was, on a vote, rejected by 126 to 70.

Mr. Paterson moved the omission of the last sentence of the resolution. He explained that in Durham the representatives of the employers and workmen had settled their disputes without the interference of the Chamber of Commerce, or other outside bodies.

Mr. Boyle seconded.

The mover of the resolution, Mr. Hobson, accepted the amendment, as it did not alter the principle.

The resolution, as amended, was carried.

Proposed Labour Exchanges.

Mr. Quelch (on the fourth day, September 4) moved the following resolution:—"That, in the opinion of this Congress, in order to carry out more efficiently the organisation of the large mass of unorganised labour, to bring into closer combination those sections of labour already organised, to provide means for communication and the interchange of information between all sections of industry, and the proper tabulation of statistics as to employment, &c., of advantage to the workman, it is necessary that a Labour Exchange, on the model of the Paris Bourse du Travail, should be provided and maintained by public funds in every industrial centre in the kingdom." There was not, he thought, a single delegate present who would deny the necessity for such an institution in every industrial centre, and the only points of difference likely to arise were as to the methods of acquiring and maintaining them. He contended that they should be the property of the municipality, established by public funds, and controlled by organised workmen for the benefit of organised workmen. There might have been a time when some objection could have been raised to this, but now, when they were using every effort to get the control of municipal and administrative bodies it seemed only right it should be one of the functions of these bodies to supply places of meeting where the general work of labour organisation might be carried out. He had a report of the Paris Bourse du Travail, and from that might be seen the great value of the Bourse to workmen. He hoped that some steps could be taken to secure the better organisation and complete emancipation of labour.

Mr. J. Walker seconded the motion, but it was at once shelved by the expedient of moving and carrying "the previous question."

The Eight Hours Question.

Mr. G. J. Marks moved "That, in the opinion of this Congress, the time has arrived when steps should be taken to reduce the working hours in all trades to eight per day, or a maximum of forty-eight hours per week; and, while recognising the power and influence of the trade organisations, it is of opinion that the speediest and best method to obtain this reduction for the workers generally is by Parliamentary enactment. This Congress, therefore, instructs the Parliamentary Committee to take immediate steps for the furtherance of this object."

This having been seconded,

Mr. Paterson moved, as an amendment:—"That, in the opinion of this Congress, it is of the utmost importance that an eight hours' day should be secured at once by such trades as may desire it, or for whom it may be made to apply without injuring the workmen employed in such trades; further, it considers that to relegate this important question to the Imperial Parliament, which is necessarily, from its position, antagonistic to the rights of labour, will only indefinitely delay this much-needed reform."

After a long and exciting discussion, the Congress voted on the amendment, when there were: For the amendment, 173, and against it, 181; majority against, 8. The original resolution was subsequently put to the vote, when the figures were: For the resolution, 193, against it, 155; majority for, 38.

Workshop Accommodation.

Among the motions discussed on the fifth day (Friday, September 5) was the following, moved by Mr. Lewis Lyons:—"That it be an instruction to the next Parliamentary Committee to bring the following before the Government of the day:—Any person who desires to open a factory or workshop must give notice to the Chief Inspector of Factories, at the same time to furnish particulars of that branch of industry which is intended to be carried on, a plan of the construction and interior arrangements of the establishment, and of the number of workpeople to be employed." He stated that for men and women engaged, not only in his trade, but in many others, the cubic space allotted was not sufficient. Instead of having from 400 to 600 cubic feet of breathing-space, they had only 120 feet or 180 at the highest.

Mr. Hollings seconded.

Mr. Parnell moved the addition of the following words, "And that on receipt of notice from the person desirous of opening a factory or workshop, the chief inspector of factories shall, within six days from the receipt of such notice, cause the sanitary and technical inspector to visit such place, and see whether it was sufficiently lighted and had proper sanitary arrangements for workers of both sexes, and was properly ventilated in proportion to the number of persons to be employed therein; and in all cases there shall be not less than 600 cubic feet of space provided for each person employed."

Mr. Lyons said he would accept that addition.

Mr. King thought it was ridiculous to expect that a man could say before he started business how many workers he was going to employ. If he gave notice to the inspector the latter would see that the cubic space allotted was sufficient. He would, therefore, move that the words of the resolution after the words "carried on" should be omitted.

Mr. Davies seconded the amendment. It would, he said, be quite impossible for a man to intimate the number of people he intended to employ before opening a workshop.

Mr. Lyons accepted the amendment, and the resolution as amended was agreed to unanimously.

Election of Secretary to the Parliamentary Committee.

For this appointment, vacated by the retirement of Mr. Broadhurst, M.P., there were three candidates, viz., Mr. Fenwick, M.P., Mr. G. Shipton (Secretary of the London Trades' Council), and Mr. Threlfall. In the first balloting the voting was:—Fenwick, 171; Shipton, 147; and Threlfall, 76. As no one candidate had a majority over the other two, a second ballot was taken between the two highest, which resulted as follows:—Fenwick, 197; Shipton, 181; majority for Fenwick, 16.

This practically concluded the business of the Congress, although a number of resolutions were discussed at Saturday's meeting. On Saturday there was a great procession of trade unionists through the streets, those belonging to the building trades forming, according to the *Liverpool Post* (which has given very full reports of the Congress throughout), a very imposing part of the procession.

COMPETITION.

THE TAITE WELSH INTERMEDIATE SCHOOL COMPETITION.—The award in this competition was made known last week, and in the assessor's (Mr. Ewan Christian) report the names of the successful competitors were placed in the following order:—Messrs. Phillips & Holdgate, Cardiff and Newport; Messrs. Baker & Hughes, London; Mr. T. E. Prayce, London; and Mr. R. Grierson, Bangor. It is intended to publish the assessor's report.

THE PLYMOUTH MASONS' STRIKE.—The strike of masons at Plymouth, which has lasted seven weeks and stopped some important building operations, ended on Saturday, the 6th, in a compromise. The men, who made no demand with regard to wages or hours, required the total abolition of piecework, and that, with slight exceptions, no dressed stone should be brought into the town. The masters refusing these demands, nearly three hundred men struck, and the contest was continued on both sides with great obstinacy. However, on Saturday night, representatives of masters and men met, with the result that the dispute terminated, the masters undertaking to abolish piecework and the men forgoing the other demand.

THE SHEFFIELD WATERWORKS.*

THE town of Sheffield is supplied with water by gravitation from the elevated moorlands lying to the west and north-west, the gathering-grounds forming part of the western slope of the backbone of England. The rainfall has been continuously gauged for the last fifty-four years, and averages rather more than 40 in. in depth per annum. Of this it has been ascertained from actual experience that during a period of three consecutive dry years nearly 20 in. can be collected, stored, and distributed.

The system of reservoirs may be divided into the high-level and the low-level, the distinction having reference, not to absolute height above the sea, but to the means available for conveying the water from the storage reservoirs into the various service reservoirs near the town.

High-level Reservoirs.—The high-level reservoirs are situated at Redmires, about six miles in a direct line from the centre of the town, these reservoirs being among the earliest of the large works constructed by the late Waterworks Co. They consist of three reservoirs—the Upper, Middle, and Lower Redmires—with the Oaken Clough Dam and Catch-water. They receive the flow from 2,108 acres of drainage area, and have a total storage capacity of 670 million gallons, the gathering-ground comprising the uppert part of the valley of the River Rivelin. The water from the high-level reservoirs is conveyed down a water-course, open for the greater part of its length, but covered in at the lower end, into the Hadfield or Crookes service reservoir, having a capacity of more than 21 million gallons, whence the supply is taken for the higher parts of the town.

Low-level Reservoirs.—The low-level system comprises two reservoirs upon the River Rivelin, originally constructed for mill compensation purposes, in consideration of water taken from the high-level system. Under the Sheffield Waterworks Act of 1853 these Rivelin reservoirs reverted to the Waterworks Co., compensation to the stream being provided for by the flow, over a notch-gauge or weir, of 7 cubic feet per second during twenty-four hours of every working day. The other portion of the low-level supply is composed of four reservoirs in the adjoining valley of the River Loxley, these being the Strines, Dale-Dike, Agden, and Damflask reservoirs. There is also upon the River Rivelin, immediately above the mill-compensation gauge, a small reservoir called the depositing pond, constructed for the purpose of regulating the flow of water for the mill gauge. The total capacity of the low-level system of storage reservoirs is more than 3,000 million gallons, details of which are shown in the accompanying table, which also shows the area of water-shed draining down to each system of reservoirs. The water collected in the Strines, Dale-Dike, and Agden reservoirs is conveyed through a tunnel, passing under the high ridge which divides the Loxley from the Rivelin water-shed; and uniting at the depositing pond with the water from the Rivelin reservoirs, passes through a conduit and tunnel to the service reservoirs at Crookesmoor lying immediately west of the town.

Existing Reservoir Capacities and Areas of Gathering Grounds.

Reservoir.		Capacity.	Gathering Ground.
HIGH-LEVEL.		Gallons.	Acres.
Redmires Upper		343,000,000	—
Redmires Middle		187,500,000	—
Redmires Lower		139,500,000	—
Total of High-level		670,000,000	2,108
LOW-LEVEL.			
River Rivelin	Rivelin Upper	48,500,000	2,870
	Rivelin Lower	175,000,000	
	Depositing Pond	8,000,000	
River Loxley	Agden	629,000,000	2,999
	Strines	513,000,000	2,800
	Dale Dike	486,000,000	1,089
	Damflask	1,158,000,000	3,747
Total of Low-level		3,017,500,000	13,505
Total of High-level and Low-level		3,687,500,000	15,703

In the valley of the River Ewden, lying immediately north of the Loxley valley, the Corporation of Sheffield have power to construct two

* A paper by Mr. Edward M. Eaton, Engineer, read at the Sheffield meeting of the Institution of Mechanical Engineers, on Wednesday, July 30.

other reservoirs, namely, the Broomhead and Moorhall reservoirs, for receiving the flow from a drainage area of 6,496 acres; but these works have not yet been commenced.

Summary of Supply.—The total drainage area of the works is 15,703 acres. The total available water during three consecutive dry years is 19,460,000 gallons per day of which an average of 9,113,472 gallons per day has to be sent down the streams as compensation water, leaving 10,346,528 gallons per day for the supply of the town and district. It will thus be seen that nearly one-half of the available supply of water has to be sent down the rivers for the benefit of the mill-owners and other riparian proprietors.

Redmires Middle Reservoir.—In order of date the first storage reservoir constructed was the middle reservoir at Redmires. This reservoir has an embankment 1,012 yards in length, the greatest depth of water being 36 ft.; and it is provided with two overflow weirs or by-washes, respectively 70 ft. and 104 ft. in length. Water is drawn off by means of valves placed in a masonry shaft and discharging into the lower reservoir, the valve-shaft being connected with the bank by a wooden bridge constructed in 1834. This bridge is now much decayed, and is on the point of being replaced by a bridge made of iron.

Redmires Lower Reservoir.—The next reservoir in point of age is Redmires Lower, constructed in 1847. The depth of water is 29 ft., and the length of the bank is 590 yards. Here both the water for supply and the flood-water are conveyed through a valve and overflow-shaft into a culvert passing through the bank, means being provided on the outer slope of the bank for passing surplus or flood-water into the Wyming brook and River Rivelin; while the water required for the town is taken into a gauge basin, measured through a notch, and sent down the watercourse into the high-level service reservoir.

Redmires Upper Reservoir.—The Redmires Upper reservoir, constructed in 1853–4, receives the water from its own gathering-ground, and also, by means of a catch-water drain, the additional yield of the Oaken Clough drainage area. This reservoir has a bank, 780 yards in length, the water being drawn off by means of two lines of pipes, 14 in. in diameter, laid through the bank, terminating at their inner end in a vertical cast-iron valve-tower or shaft.

These three Redmires reservoirs may be taken as types of the old practice of reservoir construction in this country. The predominant features are banks of earthwork with a puddle wall in the centre, the depth of water rarely exceeding 40 ft.; and the absence or insignificance of masonry or brickwork.

Rivelin Reservoirs.—The same general features distinguish the next two reservoirs to be described, namely the Upper and Lower Rivelin reservoirs. These two reservoirs were constructed under the Sheffield Act of 1845, to be vested in the mill-owners, who had full control over them, and power to draw off water from them as they thought fit. They were of a capacity agreed upon between the Waterworks Co. and the mill-owners; and having a gathering-ground far in excess of their storage capacity, a by-pass channel or river diversion was constructed, by means of which excessive floods were prevented from entering the reservoirs, or when these were full the whole flood from the drainage area was diverted past them. Each reservoir is provided with an overflow weir or by-wash, and water is drawn from them by means of a pipe 24 in. in diameter.

These five reservoirs, namely the three at Redmires and the two on the Rivelin, were designed and constructed by the late Mr. John Towlerton Leather, who from 1830 to 1865 was the engineering adviser of the late Water Works Co. Since the latter date the engineers responsible for the large and important reservoirs upon the Loxley have been Messrs. T. & C. Hawksley.

Depositing Pond.—In the Rivelin valley the depositing pond, also constructed by Messrs. Hawksley, is principally remarkable for its fine overflow weir and by-wash, capable of conveying away the heavy floods which are occasionally discharged from the area of nearly 5,000 acres draining down to this point.

Agden Reservoir.—In the Loxley water-shed, the first reservoir constructed was that upon the Agden Dike, having a storage capacity of 629 million gallons, the embankment being nearly 100 ft. high and containing 900,000 cubic yards of material. The water is drawn off from the reservoir by means of a valve-shaft and a culvert laid through the bank, controlled by two valves which are worked by gearing upon the top of the shaft. From the outlet culvert the water discharges into a gauge basin, where provision is made by means of a slot gauge or orifice for passing a measured quantity of compensation water down the stream. The measuring opening or slot is made capable of accurate adjustment by sliding jaws of steel, which when adjusted are locked by two padlocks; the key of one is in the hands of the clerk to the mill-owners, while that of the other is kept at the Waterworks office; it therefore requires the consent and presence of both parties to make any alteration in the measuring apparatus. The same description of slot gauge is in operation at each of the four reservoirs upon the Loxley.

Strines Reservoir.—The Strines reservoir at the head of Bradfield Dale has a bank 418 yards in length, the water being drawn off by means of a shaft and a culvert through the bank. This embankment, in common with those of the other Loxley reservoir, has an inside slope of 3 to 1; the outer slope is 2½ to 1, and is strengthened by level benchings.

Dale Dike Reservoir.—Immediately below the Strines reservoir is the Dale Dike reservoir, upon the site of, but considerably smaller than, the ill-fated reservoir which was destroyed by the disastrous inundation on March 11, 1864. The embankment which was then destroyed crossed the valley obliquely, about a quarter of a mile below the present bank; and before the reservoir was completely filled with water a landslip led to a settlement in the outer slope of the embankment, causing the puddle wall to subside and the water to flow over the top of the bank. In a few minutes the reservoir was destroyed, and the valley down to Sheffield was inundated, causing the death of 244 persons, and the destruction of an enormous amount of property. The Water Company paid no less a sum than 373,000*l.* in respect of injury and loss sustained, the disaster being happily unique so far as regards this country.

The embankment for the new reservoir was made higher up the valley, in order to avoid the treacherous ground upon which the old bank stood; but it may be interesting to state that the pipes which ran under the old bank, and which were alleged to have caused the disaster, are still in the ground, and are as tight and strong as the day they were laid. The water is drawn out of the present reservoir by means of a tunnel driven through the solid rock round the end of the embankment; two valves are provided, one behind the other, and the gearing for working them is placed in a small house near the overflow weir; the outlet from the tunnel is in a line with the foot of the by-wash. This reservoir was completed and filled with water in 1875, but was not found necessary to be brought into use until the exceptionally dry year 1887.

Rather more than a mile below this reservoir, and at the junction of the Dale Dike with the Agden Dike at Low Bradfield, is the mill-compensation gauge, over which is passed for the use of the mill-owners a quantity of water equal to 10 cubic feet per second during twenty-four hours of every working day. In a small house alongside this gauge there is a recording-machine, designed by the writer for the purpose of continuously measuring the water flowing over the gauge-bar.

Damflask Reservoir.—Immediately below this mill gauge is the tail end of the largest, and in some respects most important, reservoir belonging to this undertaking, the Damflask reservoir, which is the lowest upon the river Loxley, and has a storage capacity of 1,158 million gallons, with a depth of water of 85 ft. The water is drawn off by means of two culverts through the bank, each provided with a valve-shaft on the inner end. Having regard to the great size of the reservoir, the embankment is not long; but the works in connexion with it are enormously heavy and costly. When the reservoir is filled with water up to a certain height it has been ascertained that a band of rock upon the south side allows the water to pass through the joints and fissures, to reappear as a spring at the bottom of the embankment. It was foreseen that this might prove to be the case, but, as it was uncertain what the quantity of water passing might be, it was considered better to defer remedial measures until the reservoir was filled and proved. To stop this percolation a wing trench is being cut through the pervious rock into the underlying shale, which will be filled with puddle, so as to stop the water from passing away. At the foot of the embankment is placed the mill-compensation gauge-weir, having three slots or openings similar to those already described, while in a little house adjoining is another recording gauge, similar to that at Low Bradfield.

Distribution.—After leaving the storage reservoirs and being received into service reservoirs at Crookesmoor, the water is distributed throughout the town and district of supply by means of main pipes from 24 in. to 5 in. in diameter, laid in zones. The service-pipes are mainly 4 in. in diameter, 3-in. pipes being laid in short streets and courts. The total length of the distributing-pipes is nearly 300 miles. The total daily quantity of water distributed is about 6½ million gallons, of which exactly one-third is for trade and manufacturing purposes, or for supplies in bulk to local authorities distributing water themselves.

When water was first supplied to Sheffield under constant pressure in 1869, the daily consumption was 40 gallons per head of the population supplied, of which only about 2¾ gallons per head was for trade purposes. Now, and for many years past, the quantity consumed without restriction or limitation, for all purposes other than meter supplies, has averaged not more than about 13 gallons per head per day; this happy result is due to the rigorous rejection, so far as practicable, of fittings and apparatus of an inferior character, combined with unceasing vigilance in suppressing all unnecessary waste of water.

Self-Recording Gauges.—At each of the service reservoirs a self-recording gauge, similar in construction to those at Low Bradfield and Damflask reservoir, is fixed for the purpose of measuring the water supplied to the town. These recorders have been in use since 1878; and the result of their working has been to disclose several facts relating to the supply of water, of a character very interesting to all engaged in the practical management of waterworks. So far as Sheffield is concerned, the least draught upon the reservoirs is between three and four o'clock in the morning, the maximum draught being between eleven and twelve noon; while the fact of the stoppage of work for dinner between twelve and one o'clock is strikingly manifested. Our experience indicates that in proportioning pipes for town supply, although the average daily flow through the pipes may be taken at 100, yet provision must be made for passing 50 per cent. in excess of this quantity.

In connexion with the system of pipes for water-supply, it may be interesting to compare the two specimens of pipe exhibited, each being 5 in. inside diameter. One of these is the modern cast-iron pipe, as now laid in the streets of Sheffield; the other is a wooden pipe formerly used, which was taken out of the ground during May last, after having probably lain there nearly if not quite a century. These wooden pipes were made upon the Waterworks premises, and the last of them was laid about sixty to seventy years ago.

Quality of Water.—The water supplied to Sheffield may be taken as a fair type of the excessively soft upland waters supplied to many of the large towns in the North of England. The hardness varies at different periods of the year, rarely falling below two degrees of Dr. Clarke's scale, and seldom exceeding three degrees. The extreme energy displayed by these soft waters in attacking metals exposed to their action is well shown by the specimens now exhibited of wrought-iron screw-spindle, nuts, bolts, and washers. These have been wholly immersed in the water to a considerable depth for a period of more than forty years; and the manner in which the pure metal has been eaten away is most remarkable. It has been found also that steel blades, such as razors, scissors, pocket- and table-knives, and also files, suffer complete deterioration to a considerable depth from the surface of the metal when immersed in the water for several years. This has been proved by the recovery from time to time from the reservoirs of bundles of such steel articles, which had doubtless been placed there in connexion with trade outrages in times past. The steel was found to have become converted into plumbago, whole bundles of blades being capable of being scraped away with a penknife. This fact should induce caution in the use of cast steel, when wholly and continuously immersed in water of this character.

The Corporation of Sheffield supply water to

more than 320,000 persons. The revenue from water-rates is 90,000*l.* per annum. The capital cost of the undertaking, as shown by the accounts to March 25, 1890, has been upwards of 2,115,000*l.*

Correspondence.

To the Editor of THE BUILDER.

"SALARIES OF CLERKS OF WORKS."

SIR,—I notice in your issue of the 30th ult. a letter from Mr. Dalton concerning clerks of works, as affected by the ludicrously low salary offered in the case of the Amersham job.

With much of Mr. Dalton's letter I perfectly agree, but I must protest against the assumption that men are to be found who, while capable of performing the duties of a clerk of works, are yet so utterly devoid in honesty of purpose as to be guilty of accepting an appointment at a miserably low salary rather than be out of a job, and then to compensate themselves at the earliest opportunity by suborning the interests of their employers. Such an admission is tantamount to an endorsement of all the vile trash that has lately been so lavishly bandied about concerning clerks of works in general. I maintain that if a man is capable of dishonesty there is nothing to prevent him from indulging in his wicked propensities even when in receipt of a liberal remuneration.

No, Sir, a clerk of works worthy the name is not the man to take up a job under such beggarly circumstances. The person who is the most likely to apply for it,—aye, and to be accepted,—is the young incapable pretender with plenty of assurance, and just sufficient smattering of building construction and materials as to enable him to answer satisfactorily a few theoretical questions if put to him for the purpose of testing his competency. It is from the appointment of such as these that disaster and discredit are certain to follow, with the equal certainty of the odium and disgrace attached to it being cast upon the shoulders of the *bond-fide* Clerks of Works who have acquired their proficiency out of a lifetime of practical experience, through all the grades from a journeyman upwards.

J. WOODLEY.

SQUARE TURNING.

SIR,—Will any of your readers give me the name of a firm who turns *square* wooden pilasters? I shall be obliged by your insertion of this query.

E. F. BEHRENS.

The Student's Column.

HOT-WATER SUPPLY.—XI.

PIPES AND COCKS: *continued.*

IT must have been noticed by nearly everyone that when a plug-cock is closed at all sharply, where a tolerable pressure of water exists, that a somewhat violent noise is heard in the pipe, and the pipe is sometimes shaken. It is when this noise is heard that the strain is exerted which injures soft metal pipes.

It has to be remembered that water is practically an incompressible substance, and in this respect resembles a solid body, so that when we suddenly stop a stream of water flowing under a high pressure within a confined area a considerable resistance must be expected, and this exerts itself chiefly in the vicinity of the tap where the greatest pressure is felt. Shutting a tap 50 ft. below the cold-water cistern causes a pressure of about 21 lbs. to be brought to bear on every square inch of pipe surface near the tap in question; if the tap is closed slowly the strain is reduced to a minimum, but if closed sharply the strain assumes the character of a blow. The tin-lined lead-pipe referred to overcomes this trouble to some extent, as tin is harder and of a more rigid nature than lead, but, of course, not so much so as iron.

The different strains brought to bear in this work have not only the effect of bulging and weakening lead pipe, but also an even worse effect in causing the pipe to be stretched lengthwise, which ill effect is of greater frequency than the bulging. An instance of this recently came under notice (in London) in which lead pipe of a very fair weight had been used, but which proved to be a very marked failure, owing partly to insufficient hooking up and partly to a considerable length being carried up a high, straight casing in which it was difficult to give it good support. The result was that the horizontal pipe sagged down between the hooks, and the vertical pipe became lengthened several inches by its own weight and the pressure of water within it, so that in a few months it was exactly as fig. 20. In this instance the contractors were compelled to renew the whole apparatus in iron at their own expense.

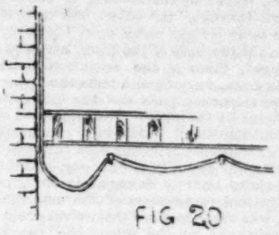


FIG 20

When the flow and return services are lead pipe it is generally necessary to have the ends nearest the boiler of iron, the former material being fusible at a moderately high temperature, and fusing is likely to occur if the pipes are furred or if the boiler is emptied (by a workman) immediately after the fire is extinguished and before the surrounding metal and brickwork have lost any of their heat.

An important point which, up to the present, has only been just touched upon, is the size of pipes most suitable for different services and purposes. This, like many other matters connected with hot-water supply, is greatly regulated by the fur difficulty, which makes it necessary to use much larger pipes than are needed in soft-water districts. There is a definite limit as to the size of pipes; and although comparatively large pipes are always recommended for the two reasons about to be explained, yet to increase the pipes beyond a certain point is most disadvantageous.

A large pipe is considered to be conducive to a freer circulation,—that is, the water can travel from boiler to tank at a greater speed on account of the lessened friction, and it is certainly beneficial for the water to leave the boiler as fast as possible when it has absorbed heat; but this advantage alone would not be generally considered of sufficient importance to warrant the great cost of larger pipes and the increased labour in fixing them. The reason which sanctions the greater outlay will be found, in nearly every case, to be the wish to lengthen the time in which pipes become furred up and require renewal.

One-inch pipe is very largely used for the main flow and return services, and it is a size that will give excellent results so long as the passage within it remains an inch, and even when the incrusted deposit has reduced the bore to ¾ in. there is very little to complain of (unless the apparatus is on an extensive scale); 1 in. may, therefore, be considered a suitable size in soft-water districts for general domestic work; but if the apparatus is of a large size, in a hotel or institution, 1¼ in., and in some instances 1½ in. should be recommended.

In hard water districts, 1¼ in. is best for ordinary residence work, but if, in a tank system, the flow and return pipes are of considerable length, an economy may be permitted by reducing the size to 1 in., say 30 ft. from the boiler, as the incrustation will be found in almost every instance to be much less at the tank end of a long pipe than near the boiler. In a cylinder apparatus, unless very small, the short flow and return from cylinder to boiler should always be 1¼ in.; all other pipes in this system may be smaller.

In the tank system the expansion-pipe and cold supply for moderate sized work may both be ¾ in., but for a good sized residence, where a fair demand for hot water exists, the supply-pipe should be 1 in., and the expansion should be increased to 1 in. also. The sizes of the draw-off services should be, 1 in. pipe for baths, ¾ in. for scullery, pantry, housemaids' sinks and general purposes, ½ in. for lavatory basins and any small purpose; these sizes, for draw-off services, are usually adopted in both small and large works on any system.

In the cylinder apparatus the primary flow and return should be 1¼ in., as mentioned; the rising main or secondary flow may be ¾ in. in small property, but never less than 1 in. in work of a fair size; if this pipe is returned (forming a secondary return) this may be ½ in. or ¾ in., according to the magnitude of the installation, and the cold supply should be either ¾ in. or 1 in. (with a full way stop-cock), also according to the importance of the work in hand. The great objection to a small cold supply service is that it reduces, *i.e.*, checks the flow of water from the taps of the apparatus.

When a pipe becomes furred, the bore becomes reduced in size, and would, if permitted, eventually become quite stopped, ending in an explosion at the boiler; but an explosion from this cause has most probably never occurred, as, before any real danger exists, such violent noises and vibrations are noticed that an experienced man is called in, owing to the apprehension of danger that arises. It is generally when the bore has been reduced to about ¾ in. (depending, however, upon the power of the boiler) that the noises are first heard, and which are caused wholly by the steam being unable to escape freely; usually the flow-pipe gets the greatest share of the fur, in which case the violence arises by some proportion of the steam forcing itself into the return pipe.

A 1¼-in. pipe will last nearly double the time a 1-in. pipe will before giving trouble, as, in the first place, a ¼-in. deposit is longer in accumulating on a 1¼-in. than on a 1-in. surface, and when the former has a ¼-in. deposit it is still fit for a great deal of service; whereas the latter is upon the point of giving trouble. It should be mentioned that it is commonly the case for the supply of hot water to become lessened and somewhat uncertain when pipes are badly furred, commencing before the noises are heard.

It is quite possible to have the pipes cleaned of fur when the occasion arises, but this necessitates their removal, and a somewhat lengthy job afterwards in heating and hammering them, and it will be found as cheap and decidedly better to replace them with new.

OBITUARY.

MR. JOHN BELCHER.—We record with much regret the death, at the age of 73, of Mr. John Belcher, F.R.I.B.A., formerly of 5, Adelaide-place, E.C. Mr. Belcher, who retired from practice in 1870, was well known in the City as an architect of varied and considerable attainments. He erected many important buildings in the City of London, as well as numerous mansions and country houses throughout the country. His son, Mr. John Belcher (now of 20, Hanover-square, W.), after a short partnership with his father, succeeded to his practice.

MR. THOMAS JACKSON.—The death is announced of Mr. Thomas Jackson, architect, Belfast, at the age of 83. He commenced to practise in Belfast nearly sixty years ago, having been articled to the late Mr. George Dymond. The *Belfast Newsletter* gives a long list of his works, which are to be found not only in Belfast, but all over Ireland.

GENERAL BUILDING NEWS.

THE NEW FRUIT AND VEGETABLE MARKET.—The *City Press* says that the contractors who are engaged on the erection of the new fruit and vegetable market have already made considerable progress with their work. The market,—which is to take the place of the old market in Farringdon-street,—is being built at the corner of Charterhouse-street and Farringdon-road. At present the efforts of Messrs. Rudd & Son, the contractors, are centred upon the substructure of the building, which has been designed by the City Architect, and will be carried out under the auspices of the Markets Committee of the Corporation. The first thing, of course, is to clear the site, and this part of the operations has been entrusted to Mr. Nathaniel Fortescue, who, with the aid of a number of excavators and three steam cranes, is removing the débris at the rate of about 300 loads a day. It is carted down to Blackfriars Bridge, where Mr. Fortescue has a "shoot," and is then sent away in barges, to be used in the filling-up of a vacant space at Dagenham. Nearly thirty carts are all day long going backward and forward between Farringdon-road and the bridge. Several weeks will elapse before the site is in full possession of the contractors for the sub-structure. The basement will be used by the Great Northern Railway Company, by arrangement with the Corporation, and the rails will be carried underneath Charterhouse-street to the Central Provision Markets, where the Railway Company will have a general goods depôt, with, of course, access from above. Steel columns will be used, and these will rest upon a foundation of concrete and blue Staffordshire bricks. On the tops of the columns, massive girders, also of steel, will rest, and the interstices will be filled in with brick arches and concrete. The Provision Markets facing the site will have to be shored up, so as to allow the putting in of columns, &c., in new positions, and allow the railway to be carried through. There will, in fact, be a reconstruction of the market basement. It may be added that on the north side of the market there will be somewhat similar works carried out by the Great Northern Railway, and that on the street level there will be erected warehouses by the company.

PROPOSED NEW TOWN HALL FOR NEWCASTLE.—A special meeting of the Town Hall and Municipal Offices Committee of the Newcastle Corporation was held on Monday. It was unanimously agreed that the City Engineer (Mr. Laws) should prepare tracings to show the street improvements deemed necessary in connexion with the four Town Hall sites,—namely, Fenkle-street, Eldon-square, Singleton House, and a new site that was suggested by Mr. Edward Stout, including the whole of the ground on the east side of Pilgrim-street, bordered on the north by Blackett-street, and as far back as Carliol-street, showing a new street line in continuation of Market-street to a point at the top of Trafalgar-street, opposite the entrance to the Blyth and Tyne Railway Station. It was also agreed that Mr. Laws should prepare at the same time a plan showing a new street line from Grey-street to the Haymarket, skirting the proposed new Town Hall, should it be eventually decided by the Council to erect one in Eldon-square.

NEW METHODIST FREE CHURCH, GRAVELLY HILL. — The United Methodist Free Church lately erected at Gravelly Hill, Birmingham, in memory of the late Alderman M. J. Hart, was opened on Tuesday last. The church stands at the junction of Tamworth and Lichfield roads, and accommodates nearly 500 people. The pulpit has been carved in pitch-pine and mahogany by Messrs. Jones & Willis, from the designs of Messrs. Ingall & Son, architects of the church. The total cost of the church is over 4,000*l.*

THE QUEEN'S HOTEL, CARDIFF.—According to the *Western Mail* the directors of the Queen's Hotel Company, Cardiff, have decided to rebuild the existing hotel. The building will consist of five floors exclusive of the basement, and will be five windows in length. The structure will be in the Renaissance style, and will be faced with red bricks, with terra-cotta ornamentation. The main entrance will be in the centre of the building, but there will be another one at the southern corner. The windows of the upper stories will be circular projecting bays on both the extreme ends of the building, working right up two floors, and finished in ornamental mansards. The total cost of the work is estimated at between 12,000*l.* and 14,000*l.* The new building has been designed by Mr. J. P. Jones of Cardiff.

THE ULSTER BANK, DUBLIN.—A branch office for the Ulster Bank, Dublin, which occupies a site immediately opposite the Houses of Parliament, is rapidly approaching completion. The front of the new building has been constructed of Ballinasloe limestone. The frontage is only 42 ft., but the height of the building is nearly 100 ft. The entrance is approached by a flight of steps leading to a porch. Ample accommodation is being provided in the interior. The central apartment has a vaulted roof, and at the end furthest from the entrance is a circular apse. Care has been taken to ensure sufficient light in all the offices. It is contemplated to light the bank by the electric light. The building will cost something like 20,000*l.* Messrs. Samuel Bolton & Sons are the contractors, and the carving is the work of Mr. Emery. The architect is Mr. Thomas Drew of Leinster-street, Dublin.

NEW WESLEYAN CHAPEL, WREXHAM. — The Mayor and Corporation of Wrexham attended in state the opening of a new Wesleyan Chapel at Wrexham, on the 5th inst. The new building is of stone, and has been constructed by Mr. Gethin, of Shrewsbury, from plans prepared by Messrs. Waddington & Son, of Burnley, and has cost over 6,000*l.* A tower with a spire has been built at the east corner of the front of the chapel. The seating capacity is 650, and a large school adjoining will find accommodation for 330.

ST. HUGH'S R.C. CHURCH, LINCOLN.—Mr. Albert Vicars, of London, is the architect for this new church.

SCHOOLS, NEWPORT, MON.—Some two years back the United District School Board of Newport advertised for designs for schools at the Spring-gardens site, to accommodate 1,000 children in three departments, and many of the local architects submitted plans for the same. The Board, after selecting two sets of drawings as most suiting their requirements, marked these drawings "A" and "B," and forwarded both sets to Mr. Bruce Vaughan, architect, of Cardiff, for adjudication, who advised the acceptance of plans marked "B," the author of these being E. A. Lansdowne, of Newport, and the schools have now been carried out under his supervision by Mr. William Price, builder, of Newport, for a sum of £6,055. 16s. 7d. The fireproof flooring has been executed by Messrs. Homan & Rogers, Manchester. The latrine and lavatory arrangements are by Messrs. Adams & Co., and Mr. Henry Richards, of Newport, acted as clerk of works.

THE ASSOCIATION OF PUBLIC SANITARY INSPECTORS OF GREAT BRITAIN will visit the Crematorium at Woking, Surrey, on Saturday, September 27. Mr. J. C. Swinburne Hanham, Barrister-at-Law, Hon. Secretary of the Cremation Society of England, will give an address on "Cremation" early in the ensuing Session.

FOREIGN AND COLONIAL.

PRAGUE.—As our readers have seen in the daily papers, owing to the flooding of the waters, the "Karls Bruecke," the oldest and most celebrated of the seven bridges which cross the River Moldau, within the precincts of the town, has been partially destroyed, three of the seventeen arches having broken down, carrying with them the upper portions of their respective piers and the interesting sculpture borne by the latter. The celebrated structure, the foundations of which were commenced 1357, may be considered as having been the most interesting historical curiosity in the city, and that it has now been so severely damaged is owing mainly to the apparent carelessness of the municipal authorities, who never troubled themselves about its state of repair, and, at the same time, permitted the weakening of the bridge by the laying of gas and water-pipes, the construction of a tram line, and the transit of heavy cars. Among the many structural accidents which have been caused by the late floods we may note the appearance of some dangerous cracks in the embankment walls. Traffic has been prohibited on the whole length of the wall.

BRUNSWICK. — The annual meeting of the German Public Health Association will be held here next week. Among the many lectures those on "Hospitals for minor towns and rural districts," "Filters in water mains," and "Workmen's homes," promise to be of special interest.

DRESDEN.—The so-called "International" Exhibition of Water-colours and Drawings, for which room has been found in the halls and class-rooms of the "Saxon Technical College," in spite of a catalogue in which the figures go up to 2,500, is but a poor concern, the hanging committee having apparently laid more stress on "quantity" than "quality" when selecting the exhibits. There is some interest in the large collection of original sketches published in the better-class comic papers of the empire. Many of the works introduce architectural subjects, in which the ignorance of the rudiments of architectural forms is somewhat startling.——The far-famed collection of the "Grüne Gewölbe" of the old "Schloss" will be closed to the public for some time hence, a restoration and extension of the two wings having been taken in hand, which, when complete, will show some interesting "German Renaissance" work.

FRANCE.—The Minister of Fine Art is to inaugurate, on the 28th, the monument raised at St. André to Berlioz.——M. Yves Guyot, the Minister of Public Works, is to proceed to Lyons shortly, to inaugurate the new Pont Lafayette, and M. de Freycinet, the War Minister, is also to lay in the same city the first stone of the École de Médecine Militaire.——The inhabitants of Eyguières, are about to raise a monument to their citizen Jules Roche, mining engineer, who took part in the expedition of Colonel Flatters in 1881, and was killed abroad.——The Conseil-Général of the Seine-et-Oise have made a concession to the Société Decauville for the establishment of a line of narrow-guage railway between Versailles and Epoue. The company has applied for a concession for a line of 150 kilomètres between Magny-en-Vexin and Villeneuve-St.-Georges. This line, which would traverse the districts of Mantes, Rambouillet, Etampes and Corbeil, would render great service to a populous neighbourhood.——M. Alphand has been appointed Curator of the Champ-de-Mars Palace.——At Trégnier a grand monument to St. Yves, the patron saint of Brittany, has been inaugurated with much ceremony and public festivities.——M. Artignes, the engineer, residing in Paris, has purchased for 600,000 francs the historic château of Hautefort, near Perigueux, once the property of the family of Damas d'Hauteforte.——It is hoped that the new Museum at Laon will be opened in the spring. It is to be situated in the old Lycée buildings.——A fine marble group, "Jeune Mère," by M. Hector Lemaire, has been presented by Baron Alphonse de Rothschild to the Museum of Dieppe.——The recent cyclone which has done so much damage in various parts of France has among other things seriously injured the chapel of Dreux, which contains the tombs of the Orléans family. The fine windows executed after the designs of Ingres have suffered much, and some of the sculptures of the façade have been seriously injured (apparently broken by the force of the wind).——At Annecy-le-Vieux the mould or matrix has just been completed for the great bell called "La Savoyarde," for the Church of the Sacré Cœur at Montmartre. The design includes a great deal of ornament of a Romanesque type, intermixed with escutcheons one of which contains the arms of the City of Paris. The casting in bronze will not, however, be proceeded with till towards the close of the year.

NEWTON HEATH BREWERY.—The contract for the Newton Heath Brewery, loose boxes and infirmary, has been let to Mr. James Byrom, builder and contractor, of Bury, his total estimate being 2,511*l.* The architects for the work are Messrs. Maxwell & Tuke, of Manchester.

MISCELLANEOUS.

PROPOSED "HANOVER EXHIBITION."—The Stuart Exhibition of last year at the New Gallery is to be followed next January by an exhibition of pictures and objects of interest connected with the House of Hanover, which will include not only portraits of the Royal Family, but also those of the most famous statesmen, lawyers, divines, commanders naval and military, and the representatives of art, literature, and science. The Committee are confident that it will be possible to bring together one of the most remarkable and instructive series of portraits of public characters ever displayed, and that the artistic success of the Exhibition will be assured by the presence of the works of such artists as Reynolds, Gainsborough, Romney, Kneller, Thornhill, Raeburn, Flaxman, Lawrence, Cosway, Wedgwood, &c. The Committee have every ground for this confidence, if their request for loans is adequately responded to. In an artistic sense, the Exhibition ought to have a success even beyond that of the Stuart Exhibition.

FROST-RESISTING CEMENT MORTARS.—Herr Bernhoffer has recently been making some experiments with a view to testing the influence of frost on the quick-setting properties of cement mortars, the results of which he has communicated to a German publication. It is well known that hydrochloric acid or a saturated solution of soda causes Portland cement to set at once and become extremely hard, and Herr Bernhoffer made mortars consisting respectively of 1 litre (about 1¾ pints) of Portland cement and 1 litre of lime, each of these being mixed with 3 litres of river sand and a solution formed of 1 kilogram (about 2¼ lbs.) of crystallised soda and 2 litres of water. These mortars were exposed in the month of December for fourteen hours and a half, the temperature ranging between 15¾ and 31¼ below zero. The specimens were then placed in a hot oven for three hours. The experiments were entirely satisfactory, as the frost to which the mortars had been exposed had produced no injurious effects in the specimens. Further experiments are to be made to see whether the mortars retain their hardness, and also whether the quantity of soda used can be reduced. The Portland cement thus treated is put down as costing 3*l.* per cubic yard, whilst the lime mortar is stated to cost 1*l.* 5s. 6d. per cubic yard.

THE NORTH YORKSHIRE AND LANCASHIRE RAILWAY.—There is every prospect of railway communication being shortly established direct from Lancashire to the north-east coast of England. The North Yorkshire and Lancashire Railway, which was intended to accomplish this, was projected some eight years ago, but was abandoned owing to opposition to the scheme. The landowners and residents in the district concerned are, however, bestirring themselves in the matter again. Several public meetings have declared in favour of a revival of the project, and we believe that Messrs. Martin and Fenwick, of Park-place, Leeds, who were the engineers for the original scheme, have been instructed to prepare plans for an application to Parliament in the next session. It is proposed that the new line should commence at Hellifield, by junctions with the Midland and Lancashire and Yorkshire Railways there, and proceed in a north-easterly direction, by Cracoe, Linton, and Grassington, to Kettlewell; thence by a tunnel under Whernside, down Coverdale and Middleham, to Spennithorne, and then, passing under the Bedale and Leyburn Railway, it will run direct to Darlington.—*Leeds Mercury.*

UPPER NORWOOD ATHENÆUM: VISIT TO HATFIELD HOUSE. — Among the many educational signs of the times, not the least is the establishment of a number of local societies having for their object antiquarian, historical, or archæological pursuits; and among these societies the Upper Norwood Athenæum, which was established in 1877, has lately been making rapid strides. It now numbers about 100 members, and on Saturday afternoon last sixty-three gentlemen (members and friends) paid a visit, by permission of the Marquis of Salisbury, to Hatfield House, under the escort of Mr. Michael Pope, the honorary secretary. On arriving at the house a descriptive paper was read thereon by Mr. Pope. As Hatfield was visited by the Architectural Association in 1888, when a very exhaustive and interesting paper was read by Mr. J. A. Gotch, we must refer our readers to the *Builder* of Sept. 15 of that year, and to that of the following week, when an illustration of Hatfield House was published by us.

THE ENGLISH IRON TRADE.—The slight depression noticeable in the English iron market last week has passed off. There is a decidedly better feeling; prices are firm, and expectations are of a much fuller enquiry in store. The pig-iron market has recovered from its late reaction. Scotch pig-iron warrants have been steadier, and makers are stiff. Middlesbrough pig-iron is 6d. a ton dearer. Makers of Bessemer iron in the north-west hold firmly to their quotation of 58s. 6d., although hematite warrants are quoted 56s. 6d. Finished iron shows continued animation, with an upward tendency. There is a healthy tone in the steel trade. More enquiries are coming forward for new ships, and engineers are also booking more work than lately.—*Iron.*

LEGAL.

COMPENSATION: THE GREEN-STREET IMPROVEMENT.

GABRIEL *v.* THE VESTRY OF ST. MARTIN'S.

THIS case, which came before Sir P. H. Edlin, Q.C., at the County of London Sessions last week, was an inquiry, under an Act of the reign of George III., known as Michael Angelo Taylor's Act, into the value of certain house-property in Green-street, Leicester-square, on the north side of the street, and at the corner adjoining Leicester-square, which is to be taken by the Vestry for the purposes of proposed improvements in Green-street.

Mr. Bidder, Q.C., was for the claimant; Mr. Winch, Q.C., and Mr. Gill were for the Vestry.

Expert witnesses were called on both sides to prove the value of the property. It appeared that it was bought by the claimant, Mr. Gabriel, in November last, at public auction, for 3,325*l.* Since then he had entered into an agreement with a Mr. Hosegood, a builder, to grant the latter a building lease of the ground for eighteen years at a ground-rent of 230*l.*, Mr. Hosegood undertaking to build houses on it in accordance with plans. Mr. Gabriel's claim, founded on this proposed ground-rent, at twenty-five years' purchase, and increased by 10 per cent. on account of compulsory sale, amounted to 6,957*l.* There was a further claim on behalf of Mr. Hosegood, the subject of another inquiry, on account of his interest in the property.

The jury assessed the compensation due to Mr. Gabriel at 3,850*l.*

A CLAIM FOR WAGES.

At Marborough-street Police-court, on Monday, Messrs. Stephens, Bastow, & Co., builders, of Stewart's-road, Wandsworth-road, were summoned by a number of their workmen for wages which they alleged to be due in respect to a job in South Audley-street. Mr. Bernard Abrahams, solicitor, appeared in support of the summons; and Mr. Leslie, solicitor, conducted the defence. Several of the men were called, and from their evidence it transpired that on their applying for their wages on Saturday, August 23, they received a sum of money on account, and were told that they could not be paid in full, because the architect's certificate had not been received. On the following Monday and Tuesday they went to work, and continued at work till about nine o'clock on the morning of the latter day. They remained on the premises during Tuesday, but did not work, and on the Wednesday morning on going to the job and hearing that no money was forthcoming they applied for and obtained the summonses, twenty-eight in number. They claimed to be paid up to the Wednesday night, inasmuch as they were not discharged, but the firm on August 30 had paid them only up to the Tuesday morning. Some of the men then resumed work, but others insisted upon their claim for both wages and legal expenses. For the defence it was stated that, although the men were not formally discharged, they were told that if they would not work they might take their tools and go. They were not engaged under contract, and therefore could only claim for the work actually done. Moreover, although they were not discharged, they practically discharged themselves by declining to continue to work, and made no further claim at the time the balance of the wages was paid. Mr. Hannay, in giving his decision, said that by ceasing to work the men had committed an act for which they might at once be discharged; but as they were not formally discharged they were in strict legality entitled to pay for the whole of the Tuesday. But he thought that, under the circumstances, in equity, it would be very harsh and unfair to make the masters pay for that for which they received no consideration, and he would therefore make no order in the case.—*Times.*

RECENT PATENTS:

ABSTRACTS OF SPECIFICATIONS.

14,936.—CARPENTER'S CRAMP: *S. J. Ainge.*—This cramp is constructed of several bars or straps of iron, coupled with pins and forming joints. It is furnished with a pair of powerful toothed jaws, actuated by right and left screws. When the screw is turned the sides of the cramp are thereby drawn simultaneously together, and the jaws—which are united to and operated by a pair of the straps, which act as levers—are brought into instant contact with the floor-joist, which they grip so firmly that slipping is impossible, while at the same time one of the bars presses against the floor-board at whatever angle it may lie with respect to the joist, and forces it into and retains it in the desired position. It can be adjusted to joists of various thicknesses, and used in the making of doors, windows, &c.

14,963.—FIRE-RESISTING FLOORS: *H. Stanton.*—In order to dispense with the use of concrete in addition to the slabs, or to attain greater rigidity, earthenware struts are used to support a floor or ceiling of tiles or slabs. The shield below the joists protects them from the action of fire, and also by keeping the slabs some distance below them leaves an air-space, that the heat may be distributed or radiated instead of coming at once to the joists.

15,005.—NETTING FOR CEILINGS, &c.: *C. Rabitz.*—According to this invention, a double wire-netting is used in the manufacture of fire-proof ceilings, walls, &c. Each of the two nettings employed is held by connecting wires, at the distance which is best adapted for fire-proof lining, and the two nets may be rolled up easily for storage.

18,192.—STOPPERS FOR DRAINS: *J. Jones.*—According to this invention, a rim of rubber or elastic substance is compressed between two plates operated by a screw. Drawing the plates together forces the rubber beyond the edge, and makes a water-tight joint.

6,406.—WATER-WASTE PREVENTERS: *F. S. Streeter.*—By this patent the delivery of water to the closet-pan is controlled through a valve through the medium of a sort of "dash-pot" or hydraulic connexion, whereby the closing of a delivery-valve is independent of the pull-handle.

9,328.—ROOFING OR SHEATHING TILES: *W. Fairweather.*—This invention relates to tiles of clay or other material for exterior architectural use, and consists of surface tiles of rectangular character constructed so as to cover the edges of adjacent tiles at the junctions or termini of different planes in which the sheathing or roofing is laid, and to fit such parts as the ridge, the hip, the valley, or the eave of the roof. The tiles can be made ornamental as well as useful.

9,897.—WHITE PIGMENTS: *J. Gordon.*—This patent refers to what is claimed as an improved process for making white pigments of lead, in which galena, in a finely powdered condition, is injected into the upper part of a furnace heated with coke, the galena being oxidised and converted into a fume.

NEW APPLICATIONS FOR PATENTS.

Aug. 25.—13,336, A. Cashin, Securing Knobs or Handles to Door Locks and Latches, and to Door Knob Roses.—13,351, J. Hamblet, Ornamental Flooring, Tiles, &c.—13,361, H. Deane, Cooling Rooms and Spaces.—13,371, H. Harris and W. Power, Electric Bells and Indicators.—13,374, J. Barclay and J. Meikle, Kilns, &c., for drying and burning bricks, pottery, &c.

Aug. 26.—13,399, J. Wilson, Stench Traps.—13,436, F. Roberts, Pottery Kilns.—13,438, C. Bronk, Squares for Carpenters, &c.

Aug. 27.—13,476, W. Downing, Weather Bars or Draught Excluders for Doors, Hinged Windows, &c.

Aug. 28.—E. Hanworth, Draught and Rain Excluder for outer doors of buildings.—13,523, C. Horner, Appliances for Doors.

Aug. 29.—13,590, W. Sturmey, Door Locks and Latches.—13,625, J. Braidwood and J. Johnston, Fire-proof Construction of Buildings.

Aug. 30.—13,643, T. Harries, Finger Plate for Doors.—13,647, G. Tunks, Cowl or Extractor for Chimneys.—13,649, J. Barraclough, Privies or Closets.—13,695, W. Brady, Nail-Driving Tool.—13,699, F. Berry, Electric Bells or Gongs.

PROVISIONAL SPECIFICATIONS ACCEPTED.

7,074, A. Wilson, Bolt for Doors.—9,465, A. Moore and H. Petts, Sheet-metal Roofing.—9,999, M. Halschick, Purifying and Cooling Air for Ventilation.—11,273, T. Kenyon, Catches for Doors and Windows.—13,346, R. Curry and others, Coupling or Joining Water-pipes, &c.—11,451, L. Wilkes, Window-fastener.—11,522, J. Bayly, Construction of Dry Walls.—11,588, S. Hill and F. Lilley, Fastening Skylight Windows, &c.—11,597, W. Cawdery, Mortice Gauge for Carpenters.—11,726, G. Couch, Window Sashes and Frames.—11,752, W. Welch, Ventilator for Sewers.—11,763, F. Valentine, Fastener for Window-sashes, &c.—11,796, E. Dupont, Compound Plates or Slabs of Cement, &c.—11,831, W. Lister, Glazing Bars or Astragals for Roof-lights and Windows.—11,882, F. Weldon, Scaffold Attachment, &c.—12,474, J. Martin, Pigments or Paints.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

16,192, C. Broad and C. McCann, Sills for Windows, &c.—16,527, W. Meakin, Attaching Sash-lines to Sashes.—16,888, T. Sixsmith, Plank Supporting Frames for Builders.—8,563, B. White and J. Boyd, Brick-making Machines.—3,705, C. Bischoff, Binding-plate for Brick and other Walls.—11,782, T. and J. Mann, Kitchen-ranges.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

AUGUST 28.—By *Worsfold & Hayward* (at Dover): 6 and 7, Worthington's-lane, 47, York-st., 7 and 9, Atholter., 1 to 6, Athol-ct., 51, East Cliffe, and 11 to 14, Victoria-row, Dover, f., 1,430*l.*; 64, Bulwark-st., 1, 2, and 3, Wellard's-cottages, u.t. 35 yrs., g.r. 23*l.* 1s. 8d., 215*l.*; 9, 10, 11, 21, and 22, River-st., River, near Dover, f., 415*l.*; a farm-yd. and outbuildings, f., 220*l.*; a freehold house, Sutton, near Dover, r. 11*l.* 10s., 220*l.*

SEPTEMBER 1.—By *Smart & Co.*: 7, Dagmar-villas, Wood-green, u.t. 64 yrs., g.r. 3*l.* 16s., r. 25*l.*, 180*l.*

SEPTEMBER 2.—By *Weston & Son*: 18 and 19, Arthur-rd., Brixton, u.t. 73 yrs., g.r. 10*l.* 5s., r. 64*l.*, 545*l.*; 157 and 159, Shakespeare-rd., u.t. 82 yrs., g.r. 10*l.* 10s., r. 60*l.*, 500*l.*; 20, Evandale-rd., u.t. 24 yrs., g.r. 4*l.* 13s., 320*l.*; 65, St. James'-rd., u.t. 73 yrs., g.r. 7*l.* 10s., 400*l.*; 40 and 42, Church-rd., u.t. 5 yrs., g.r. 8*l.*, r. 62*l.*, 105*l.*; 153, Kennington-rd., Kennington, u.t. 42 yrs., g.r. 10*l.*, r. 50*l.*, 600*l.*; 30, Fleming-rd., Walworth, u.t. 42 yrs., g.r. 4*l.*, r. 32*l.*, 350*l.*—By *G. Pearce & Sons*: 14, 16, 18, and 20, Rotherfield-st., and 2, Sherborne-st., Islington, u.t. 32 yrs., g.r. 20*l.*, r. 90*l.*, 530*l.*; 59, Buckland-st., Hoxton, u.t. 44 yrs., g.r. 5*l.*, r. 34*l.*, 325*l.*

SEPTEMBER 3.—By *Protheroe & Morris*: "Comber-mere" and "Sexey" villas, Birkbeck-rd., Leytonstone, f., r. 46*l.*, 565*l.*

SEPTEMBER 4.—By *Newbon & Harding*: 70 and 72, Wellington-rd., Barnsbury, u.t. 53 yrs., g.r. 12*l.*, r. 72*l.*, Hampstead-rd., u.t. 53 yrs., g.r. 12*l.*, r. 70*l.*, 600*l.*

SEPTEMBER 5.—By *A. F. Pocock*: 32, Ampthill-sq., 475*l.*; 7, Hamilton-rd., Highbury, u.t. 57 yrs., g.r. 7*l.*, r. 40*l.*, 340*l.*—By *Cane & Co.*: 3, Ivanhoe-rd., Peckham, u.t. 86 yrs., g.r. 5*l.* 5s., 215*l.*; 128 and 130, Sumner-rd., u.t. 76 yrs., g.r. 7*l.* 10s., r. 70*l.*, 600*l.*

[*Contractions used in these lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; f.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.]

PRICES CURRENT OF MATERIALS.

	£ s. d.	£ s. d.
TIMBER.		
Greenheart, B.G. ....ton	6 10 0	7 5 0
Teak, E.I. ....load	10 0 0	13 0 0
Sequoia, U.S. ....foot cube	0 2 3	0 3 0
Ash, Canada ....load	2 10 0	4 5 0
Birch "	2 5 0	4 5 0
Elm "	3 10 0	4 15 0
Fir, Dantzic, &c.	2 0 0	3 15 0
Oak "	2 10 0	4 10 0
Canada "	5 0 0	5 10 0
Pine, Canada red	2 10 0	3 10 0
" yellow	2 0 0	5 10 0
Lath, Dantzic ....fathom	5 0 0	6 0 0
St. Petersburg	5 0 0	7 0 0
Wainscot, Riga, &c. ....log	0 0 0	0 0 0
Deals, Finland, 2nd and 1st. std. 100	7 15 0	10 0 0
" " 4th and 3rd	7 0 0	7 10 0
Riga	6 0 0	8 10 0
St. Petersburg, 1st yellow	9 10 0	14 10 0
" 2nd "	7 10 0	9 0 0
" white	7 0 0	10 0 0
Swedish	7 0 0	15 0 0
White Sea	8 0 0	17 0 0
Canada, Pine, 1st	13 0 0	24 0 0
" " 2nd	9 0 0	16 0 0
" " 3rd, &c.	7 0 0	10 0 0
" Spruce, 1st	8 10 0	10 10 0
" " 3rd and 2nd ..	6 10 0	8 0 0
New Brunswick, &c.	5 10 0	7 10 0
Battens, all kinds	4 10 0	15 10 0
Flooring Boards, sq., 1 in., prepared, First	0 10 0	0 14 0
Second	0 8 0	0 10 6
Other qualities	0 6 0	0 7 9
Cedar, Cuba ....foot	0 0 3½	0 0 4
Honduras, &c.	0 0 3½	0 0 4½
Mahogany, Cuba	0 0 4½	0 0 6½
St. Domingo, cargo average ..	0 0 4½	0 0 6½
Mexican "	0 0 4½	0 0 5½
Tobasco "	0 0 5½	0 0 6½
Honduras "	0 0 5½	0 0 6½
Box, Turkey ....ton	4 0 0	13 0 0
Rose, Rio	13 0 0	19 0 0
Bahia	12 0 0	18 0 0
Satin, St. Domingo ....foot	0 0 9	0 1 3
Porto Rico	0 0 10	0 1 6
Walnut, Italian	0 0 4	0 0 7
METALS.		
IRON—Bar, Welsh, in London tn	6 10 0	8 17 6
" " at works in Wales	6 0 0	6 10 0
" Staffordshire, in London..	7 0 0	8 0 0
COPPER—British, cake and ingot	65 0 0	65 10 0
Best selected	67 0 0	68 0 0
Sheets, strong	73 0 0	74 0 0
Chili, bars	61 12 6	0 0 0
YELLOW METAL ....lb.	0 0 6½	0 0 6½
LEAD—Pig, Spanish ....ton	13 10 0	0 0 0
English, com. brands	0 0 0	0 0 0
Sheet, English, 3 lbs. per square foot and upwards....	15 0 0	0 0 0
Pipe	15 10 0	0 0 0
ZINC—English sheet ....ton	25 10 0	26 0 0
TIN—Straits	99 0 0	0 0 0
Australian	99 0 0	0 0 0
English Ingots	101 0 0	0 0 0
OILS.		
Linseed ....ton	24 10 0	24 15 0
Cocoanut, Cochin	33 10 0	34 0 0
Cocoanut, Ceylon	32 10 0	0 0 0
Palm, Lagos	29 0 0	0 0 0
Rapeseed, English pale	31 0 0	0 0 0
" brown	29 10 0	0 0 0
Cottonseed, refined	21 10 0	0 0 0
Tallow and Oleine	21 0 0	40 0 0
Lubricating, U.S.	5 10 0	6 0 0
" refined	7 0 0	12 0 0
TAR—Stockholm ....barrel	1 0 6	0 0 0
Archangel	0 14 6	0 0 0

TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *noon on Thursdays.*]

ALVERSTOKE.—For alterations, additions, repairs, painting, &c., at the Alverstoke National Schools. Mr. W. Yeardye, architect:—

W. Rapley	£488 1 0
C. J. Lear	454 1 1
J. Croad (accepted)	420 9 0

ALVERSTOKE.—For the erection of iron emergency staircases and alterations to wards at the Alverstoke House of Industry. Mr. W. Yeardye, architect, Gosport. Quantities supplied:—

J. Plummer	£138 0 0
J. Cockerell	137 0 0
J. Croad	131 0 0
C. J. Lear	128 0 0
W. Rapley	115 14 6½
C. M. Dash	115 13 8
T. P. Hall, Southsea (accepted)	99 0 0

BEAUFORT (Mon.).—For the erection of a church at Beaufort, Mon. Messrs. Halliday & Anderson, architects, Cardiff:—

T. Price	£1,429 0 0
W. Bowers & Co.	1,172 0 0
J. Davies	1,123 0 0
John Haines, Cardiff (accepted) ..	1,050 0 0

BEDFORD.—For paving and road-making in De Parys-avenue and Holme-street, Bedford, for the Bedford Urban Sanitary Authority, under the direction of the Borough Surveyor, Corn Exchange, Bedford:—

Victoria Stone Co.	£1,817 0 6	Victoria stone.
J. Jackson	1,825 0 0	Victoria stone.
	1,820 16 0	Croft stone.
Black Bros., Bedford	1,796 3 9	Croft adamant paving.
W. Jarvis & Son, Bedford*	1,753 13 0	Croft adamant paving.

* Accepted.

BEIGHTON (near Rotherham).—For excavating and filling-in trenches and other water-supply work at Beighton, near Rotherham, for the Rotherham Rural Sanitary Authority. Mr. D. Jennings, surveyor, 7, Howard-street, Rotherham :—

Dearden & Jackson, Sheffield	£554 14 4
J. Lister, Aston, Rotherham	346 2 0
C. Green, Rotherham	283 8 11
H. Sykes, Beighton	278 9 1

CHELL.—For the erection of iron exit staircases, new mortuary, and alterations at the Workhouse, Chell, near Burslem, for the Wolstanton and Burslem Union Guardians. Mr. W. H. Whalley, architect, Queen-street, Burslem :—

N. J. Bennett	£406 15 0
U. Grant	370 0 0
T. Cooper	320 10 0
J. J. Longden, Burslem (accepted)	310 0 0
Iron Exit Staircases.	
St. Pancras Iron Works Co., London*	149 0 0

* Accepted.

CROMER (Norfolk).—For the extension of concrete breakwater at Cromer, for the Commissioners for the Protection of Cromer from the sea. Mr. J. E. Teasdel, Engineer, 3, Queen-street, Great Yarmouth :—

Wm. Swales, Shoreham	£1,360 0 0
Wm. Cork, Great Yarmouth	1,221 10 0

DONISTHORPE.—For building twenty cottages at Donisthorpe, near Ashby-de-la-Zouch, for the Donisthorpe Colliery Co. Mr. T. H. Fosbrooke, architect, Berridge-street, Leicester :—

Jas. Savegar	£3,575 19 0
Lowe & Sons	3,150 0 0
H. Simpkin	3,107 0 0
J. & T. W. Selby	2,975 0 0
E. & J. Clarke	2,640 0 0
Clarke & Harris	2,590 0 0
W. Moss	2,550 0 0
W. Crane	2,450 0 0
G. Duxbury	2,300 0 0
W. E. Shaw	2,250 0 0
G. R. Pike, Ashby-de-la-Zouch*	2,240 0 0

* Accepted.

DOUGLAS (Isle of Man).—For marble mosaic paving, harbour improvements, Victoria Pier, Douglas. Mr. H. A. Cheers, architect, Twickenham :—

Mainzer & Kempthorne, 18, Berners-street, W. (accepted)	£330 0 0

FAREHAM.—For alterations and additions at the Fareham Union Workhouse. Mr. Wm. Yeardye, architect, Gosport. Quantities supplied :—

H. F. Boulton	£1,385 0 0
G. H. Blackman	1,270 0 0
J. Croad	1,260 0 0
H. Jones	1,190 0 0
Lowe & Son	1,185 0 0
T. P. Hall	1,184 0 0
W. Learmouth	1,164 1 0
E. Tutte	1,160 0 0
F. G. White & Sons	1,158 0 0
C. Conway	1,149 18 0
W. Snee	1,131 0 0
Fullford's Trustee	1,105 0 0
C. Wareham	1,054 0 0
J. Plummer	1,050 0 0
J. Crockerell	1,010 0 0
G. Stallard, Havant (accepted)	1,010 0 0

FROME.—For the erection of new offices at Frome. Messrs. Halliday & Anderson, architects, Cardiff :—

Robert R. Facey	£4,900 0 0
Wm. Church	4,444 0 0
Thomas Strong	4,189 12 0
Reed, Blight, & Co.	4,115 0 0
Wm. Cowlin & Son	3,888 0 0
Jacob Long & Sons	3,883 0 0
G. Humphreys	3,799 0 0
Hodder & Son	3,700 0 0
John Vallis	3,697 10 0
J. Crook & Son	3,697 0 0
W. Bowers & Co.	3,643 0 0
Z. S. Chislett & Son	3,610 0 0
Joseph Bird, Radstock (accepted)	3,500 0 0

GOSPORT.—For the erection of iron building to form New Library. Mr. Wm. Yeardye, architect, Gosport :—

J. Croad, Gosport (accepted)	£159 0 0

HERNE BAY.—For erecting four residences facing the Parade. Mr. Frederick Lea, architect :—

Cornelius, Whitstable	£7,620 0 0
Gerrans, London	6,800 0 0
Adams, Herne Bay (accepted)	6,400 0 0

HEXHAM.—For relaying pipe sewer, with manholes, &c., at Hexham, for the Local Board. Mr. R. Grieves, Surveyor, Priestpopple, Hexham :—

Wm. Carr, Hexham (accepted)	£183 4 0

HEXHAM.—For alterations and additions to Local Board offices and stable premises. Mr. R. Grieves, Surveyor :—

J. Herdman & Son, Hexham*	£403 4 0

* Accepted.

LINCOLN.—For the erection of a new Liberal Club, Saint Swithin's-square, Lincoln (exclusive of the cost of heating), for the Liberal Club Company, Limited. Messrs. Sington & Brameld, architects, Manchester. Quantities supplied :—

Hockley & Sons	£3,050 0 0
Reid, Blight, & Co.	2,986 10 0
Bridgefoot & Son	2,485 0 0
Ed. Bowman	2,457 0 0
Wright & Sons	2,405 13 0
H. S. & W. Close	2,345 0 0
S. Horton	2,285 0 0
J. B. Harrison	2,247 19 0
R. Crosby	2,241 0 0
Lansdowne & Sons, Lincoln*	1,970 2 4

* Accepted.

LEICESTER.—For ironwork for sewers, Leicester, for the Corporation. Mr. E. G. Mawbey, C.E., Borough Surveyor, Town-hall, Leicester :—

Blakeborough & Sons, Brighouse	£527 15 0
Goodwin, Barsby & Co., Leicester	277 18 6
S. Wright, Leicester (accepted)	262 2 0

LIVERPOOL.—For the construction of (1) a twelve-cell refuse destructor, with cremators; (2) a chimney, 180 ft. high; and (3) ironwork, &c., inclined cartway, platform, shed, &c., at Liverpool, for the Liverpool Corporation. Mr. H. Percy Boulnois, Engineer :—

Destructor.	
Manlove, Alliott, & Co., Limited, Nottingham	£2,000 0 0
Ironwork.	
Manlove, Alliott, & Co., Limited, Nottingham	2,067 0 0
Chimney.	
Kelly Brothers, Walton, Liverpool	1,174 0 0

LLANDAFF.—For the erection of a residence at Llandaff. Messrs. Halliday & Anderson, architects, Cardiff :—

W. Symonds	£2,560 0 0
Howell & Co.	2,525 0 0
S. Shepton	2,476 0 0
F. Stock	2,250 0 0
John Haines	2,195 0 0
Bowers & Co., Hereford (accepted)	2,140 0 0

LONDON.—For building a hospital in Austin-street, Bethnal Green, E. Mr. R. H. Hill, architect, 3, Lombard-court, E.C. :—

Langdale & Hallett	£12,000 0 0
Chappell, J. T.	10,201 0 0
Nightingale	9,954 0 0
Holloway Bros.	9,581 0 0
Marsland	9,475 0 0
Outhwaithe & Co.	9,445 0 0
Mortar, J.	9,420 0 0
Coxhead, J. J.	9,333 0 0
Gregory, T.	9,287 0 0
Lawrence & Son	9,275 0 0
Holloway, H. L.	9,173 0 0
Greenwood, J., & Son	9,155 0 0

LONDON.—For pulling down and re-building the "Jolly Gardeners" Tavern, Princes-street, Lambeth-walk. Mr. R. A. Lewcock, architect, 88, Bishopsgate-street Within :—

J. Anley	£6,047 0 0
J. Ivory	6,030 0 0
Gould & Brand	5,889 0 0
Spencer & Co.	5,838 0 0
Harris & Wardrop	5,646 0 0
S. Goodall	5,470 0 0
Todd	5,414 0 0
Allen & Sons	5,348 0 0
Voller	5,262 0 0

LONDON.—For alterations to the "Lord Westbury" public-house, 418, Wandsworth-road, for Mr. J. Booker. Messrs. Eedle & Meyer, architects, 8, Railway-approach, London-bridge :—

Burman & Son	£935 0 0
Walker	764 0 0
Colls & Son	738 0 0
J. Beale	700 0 0

LONDON.—For rebuilding No. 83, Bishopsgate-street Without, for Mr. Wm. Wright. Mr. J. Hatchard Smith, architect, Finsbury-pavement :—

Alfred Hood, Bethnal Green-road	£1,950 0 0

Accepted as amended.

LONDON.—For re-building the "Horse and Dolphin" public-house, Macclesfield-street, Soho, for Mr. W. Crimmen. Messrs. Saville & Martin, architects, 86 and 87, Strand, W.C. Quantities supplied by the architects :—

H. & E. Lea	£4,030 0 0
B. E. Nightingale	3,923 0 0
T. Gregory & Co.	3,777 0 0
S. Goodall	3,629 0 0
E. Toms	3,567 0 0
Ward & Lamble	3,540 0 0
Gould & Brand (accepted)	3,466 0 0
W. Oldrey & Co.	3,300 0 0
Pewterer's work.	
F. J. Ruse (accepted)	197 0 0
Gasfitter's work.	
E. Pragnell (accepted)	139 0 0

LONDON.—For carrying out sanitary alterations and other improvements at the Fulham Liberal Club, No. 69, Britannia-road, Walham-green. Mr. J. H. Morewood, sanitary engineer :—

J. Peattie	£393 0 0
Seward & Davis	365 0 0
W. Weller	293 0 0
F. L. Linzell	277 0 0
H. E. Tomes	194 5 0
C. J. Crosby	125 0 0
F. W. Serff	122 10 0
Joseph West, 176, Lillie-road, West Kensington (accepted)	107 0 0

LONDON.—For business premises at Forest Gate. Mr. C. J. C. Pawley, architect, 66, Victoria-street, S.W. Quantities by Mr. J. W. Bailey, High-road, Kilburn, N.W. :—

T. L. Green	£6,020 0 0
Patman & Fotheringham	5,992 0 0
King & Son	5,158 0 0
Perry & Co.	4,909 0 0
Flew & Co.	4,869 0 0
A. M. Deacon	4,864 0 0
F. Gill	4,855 0 0
R. G. Battley	4,727 0 0
Turtle & Appleton, Clapham Junction (accepted)	4,690 0 0

LONDON.—For building an extension to mathematical instrument works at Great Turnstile, Holborn, for Mr. W. F. Stanley. Mr. C. F. Hayward, architect, 47, Museum-street, Bloomsbury :—

Jas. Baguley	£2,870 0 0
G. E. Bryan	2,724 0 0
H. Bush & Sons	2,701 0 0
Jas. Smith & Sons (accepted)	2,615 0 0

LONDON.—Accepted for alterations at the "Hand and Crown," 93, New Oxford-street, for Mrs. Ward :—

Steadman (*re* gas)	£135 0 0
Heath (pewtering)	89 0 0

LONDON.—For rebuilding the "Shakespeare" public-house, Goswell-road, for Mr. Walter Knight. Mr. J. T. Alexander, architect, 40, Great James-street, Bedford-row :—

J. Beale, Westminster-bridge-road	£1,822 0 0

LONDON.—For alterations at the "Duchess of York" tavern, Kingsland-road. Mr. R. A. Lewcock, architect, 88, Bishopsgate-street Within :—

S. Goodall (accepted)	£578 0 0

LONDON.—For alterations to the "White Hart" tavern, Kennington-cross, for Mr. Dare. Messrs. Eedle & Meyer, architects, 8, Railway-approach, London-bridge :—

J. Beale, Westminster-bridge-road	£214 0 0

[No competition.]

PLUMSTEAD.—For paving and making-up twenty-four new streets at Plumstead, for the Board of Works for the Plumstead District. Mr. Walter G. Forder, Surveyor to the Board :—

Name of Road or Street.	Adams, Kingsland.	Nowell & Robson, Kensington.	Mowlem & Co., Westminster.	Woodham & Fry, Greenwich.	Rackham & Bentham, Plumstead.	Geo. Bell, Tottenham.	Catley, Lloyd's-square.
Reidhaven-road	£859	£947	£903	—	*851	£927	£984
Gavin-street	213	230	213	—	*203	231	248
Abery-street	314	348	312	—	*297	341	358
Garibaldi-street	318	322	308	—	*295	341	370
Gunning-street	271	274	254	—	*246	281	300
Bateson-street	132	148	128	—	*124	148	141
White Hart-lane	331	321	307	—	*273	290	339
Barth-road	661	715	646	—	*602	691	795
Kentmere-road	344	345	*333	—	334	366	415
Hartville-road	309	328	302	—	*285	323	460
Mabyn-road	185	240	*225	—	266	253	350
Marmadon-road	*281	325	305	—	282	316	470
Glenside-road	308	221	306	—	*303	334	402
Parkdale-road	709	714	*647	£759 0	629	706	—
Riversdale-road	458	448	*429	467 10	399	470	—
Speranza-street	407	415	385	458 0	*374	429	—
Hull-place	90	93	83	99 10	*81	102	—
Purrett-road	917	919	*879	989 0	862	979	—
Chestnut-road	1,354	1,358	*1,261	1,449 0	1,196	1,359	1,600
Brewery-road	215	200	*185	238 0	185	192	273
Blendon-road	*443	491	447	639 0	495	619	—
Hargor-road	292	280	*266	314 0	259	292	—
Willenhall-road	379	366	*349	419 0	346	339	—
Upper Ripon-road	320	321	*305	367 0	310	341	—
Totals	£10,110	10,469	9,778	—	9,497	10,670	—

* Accepted.

Tenders which were ruled informal were received from Messrs. Marshall, of Brighton, and Ballard, of Child's-hill.

Total amount of accepted tenders	£9,537 0 0
,, ,, tar paving 21,000 yards	2,032 9 0
Total cost of work	£11,569 9 0

The following tenders for tar paving the above-mentioned streets were submitted, viz. :—

A. T. Catley, Lloyd's-square, at 2s. 6d. per sup. yard.
T. Adams, Kingsland, at 2s. 2½d. per sup. yard.
Bensted, Maidstone, at 2s. 2½d. per sup. yard.
Hobman, Bermondsey, at 2s. 1d.* per sup. yard.
Marshall, Brighton, at 2s. per sup. yard.
G. G. Girling, Woolwich, at 2s. per sup. yard.
Geo. Bell, Tottenham (Sample A), at 1s. 11½d. per sup. yard.
Hancock & Son, Plumstead, at 1s. 11d.‡ per sup. yard.
Geo. Bell, Tottenham (Sample B), at 1s. 10½d. per sup. yard.
Hancock & Son, Plumstead, at 1s. 10d.† per sup. yard.
Woodham & Fry, Greenwich, at 1s. 9½d. per sup. yard.

* Accepted for 9 roads. † Accepted for 13 roads. ‡ Accepted for 2 roads.

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITIONS.

Nature of Work.	By whom Advertised	Premium.	Designs to be delivered.
*New Municipal Buildings	Oswestry Twn Council	50*l.* and 20*l.*	No date
*Furnishing New Council Chamber	York Corporation	20*l.*	do.

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
Granite Road Metal	Melton Mowbray U. B.	Edmd. Jeeves	Sept. 16
Road Metal (1,000 tons)	Drumcondra Town Com	*Official*	do.
Reading-room, &c. Dairycoates, Hull	N. E. R. Co.	Wm. Bell	Sept. 17
Work at Fever Hospital, Darlington	Hospital Committee	*Official*	do.
Making a New Street, Leek		Thos. Brealey & Son	Sept. 18
Driving Sheet Piling (400 lin. ft.)	London & Glasgow Engineering, &c Co. Lim.	John A. Warren	do.
Enlargement, &c. of Lavatories at Workhouse	Hollingbourn Union	*Official*	do.
*Custom House, Blyth	Com. of H M. Wks, &c.	do.	do.
Work at Union Workhouse	Cardiff Union	do.	Sept. 19
Villa, Stabling, &c. South Moor, Newcastle-on-Tyne	Dr. R. E. Johnson	J. W. Ronnthwaite	Sept 20
Sewering Paving, &c. Eastville	Stapleton R.S.A.	A. J. Saise	Sept. 21
Coachhouse, Outhouses, &c	Gateshead Union	*Official*	do.
Storage and Service Reservoirs, &c. (Contract No. 3)	Mountain Ash (Glam.) Local Board	Jas. Mansergh	do.
*Public Baths and Washhouses	Stockton-on-Tees Corp.	K. P. Campbell	do.
*Painting, &c. Works, Darenth Asylum and Schools	Met. Asylums Board	A. & C. Harston	do.
*Supply of Forage	Tottenham Local Bd.		Sept. 23
*Supply of Granite Spalls	West Ham Union	*Official*	Sept. 24
*supply of Wood	do.	do.	do.
Public Baths	Borough of Salford	Maugnall & Littlewood	do.
*Sewerage Works	Richmond (Surrey) U.R.A.	W. Brooke	do.
*Sewerage Works	St. Marylebone Vestry	*Official*	Sept. 25
Making New Streets, Sewering, &c. Burton-on-Trent	Marquis of Anglesey		Sept. 27
Covering in 150 feet of a River	Newry Town Commrs.	J. L. D. Meares	Sept. 29
*Supply of Stores for One Year	G. W. R. Co.	*Official*	do.

CONTRACTS.—*Continued.*

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer	Tenders to be delivered.
*Store Buildings, Wrought-iron Railings, &c. Kennington-park	London County Council	*Official*	Sept. 29
*Storm Relief Sewer, Mare-street, Hackney	do.	do.	do.
*Lime Store, Machinery, &c. Barking Sewage Works	do.	do.	do.
*New Postal Sorting Houses, Paddington	Com. of H.M. Works	do.	Sept. 30
*Telegraph Factory, Mount Pleasant	do.	do.	do.
Enlargement of Board Schools	Desborough Sch. Bd.	Gotch & Saunders	do.
*New Passenger Station, North Stockton	N. E. R. Co.	W. Bell	Oct. 1
* do. do. (Ironfounder's Wrk	do.	do.	do.
Boilers, Engines, and Pumping Apparatus for Main Drainage	Belfast Corporation	*Official*	do.
Broken Limestone (1,180 tons)	Gelligaer Highway Bd.	Wm. Bevan	do.
*Pipe Sewers, &c.	Barnet Local Board	W. H. Mansbridge	Oct. 2
Extension of Gasworks at Asylum, Exminster	Visiting Committee	*Official*	Oct. 4
Harbour Works, Bray River	Bray Town Commrs.	Strype & Comber	Oct. 6
*New Buildings, New Swindon	G.W.R. Medical Fund Society		do.
Widening Railway and Construction of Tunnel, Hereford	G.W. & L. & N.W.R. Cos.	*Official*	Oct. 8
*Sludge Pressing Machinery	Richmond Main Sewerage Board	J. C. Mallise	Oct. 13
Methodist Church and Schools, Bangor, co. Down		J. H. Burton	No date
Builders' Works, St. Paul's Church, Greenock		R. Rowand Anderson	do.
New "King's Head" Hotel, Darlington	R. Fenwick & Co.	G. G. Hoskins	do.
Police Station, Rye	East Sussex C. C.	Henry Card	do.
New Weaving Sheds, Leeds	G. & R. Robinson	Thos. Winn	do.
*New Shops and Offices, Walsall		Samuel Loxton	do.
*Fitting-up Premises	London & Subur. Co-operative Stores, Lim.	Jno. Waldram	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary	Applications to be in
*Surveyor and Inspector of Nuisances	Hampton Local Board	185*l.*	Sept. 15
*Clerk of Works	Southampton Har. Bd.	3*l.* 3*s.*	Sept. 17
*Surveyor's Accountant	Hastings Town Coun.	2*l.* 5*s.*	Sept. 29

Those marked with an Asterisk (*) are advertised in this Number. Competitions, p. iv. *Contracts, pp* iv. *and* vi. *Public Appointments, p.* xviii.

READING.—For the erection of a new hospital, vagrant and receiving wards, &c., at the Workhouse, Oxford-road, Reading, for the Reading Union Guardians. Messrs. Charles Smith & Son, architects, 164, Friar-street, Reading:—

	Entrance Block and Receiving Wards.	Vagrants' Wards.	Hospital.	Total.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Searle	1,596 19 0	3,034 0 0	8,787 0 0	13,259 9 0
	88 10 0	70 0 0		
	1,508 9 0	2,964 0 0		
Goodchild	1,522 0 0	3,170 7 0	8,450 0 0	13,007 7 0
	68 0 0	67 0 0		
	1,454 0 0	3,103 7 0		
Taylor	1,628 0 0	2,950 0 0	8,560 0 0	12,888 0 0
	70 0 0	120 0 0		
	1,558 0 0	2,830 0 0		
Margetts	1,236 0 0	2,766 0 0	8,238 0 0	12,075 0 0
	78 0 0	87 0 0		
	1,158 0 0	2,679 0 0		
Patience & White	1,076 0 0	2,541 0 0	7,681 0 0	11,447 4 0
	5 10 0	45 6 0		
	1,070 10 0	2,495 14 0		
Collier & Catley	1,235 0 0	2,514 0 0	7,731 0 0	11,202 0 0
	120 0 0	158 0 0		
	1,115 0 0	2,356 0 0		
Wernham	1,197 10 0	2,506 10 0	7,768 13 0	11,180 13 0
	82 0 0	110 0 0		
	1,115 10 0	2,396 10 0		
Higgs & Sons	1,138 0 0	2,346 0 0	7,100 0 0*	10,469 0 0
	60 0 0	55 0 0		
	1,078 0 0	2,291 0 0		
Simonds	1,099 0 0	2,269 0 0	7,199 0 0	10,377 0 0
	80 0 0	110 0 0		
	1,019 0 0	2,159 0 0		
Lewis	1,266 0 0†	2,459 0 0†		
	144 0 0	168 0 0		
	1,082 0 0	2,291 0 0		

* Accepted for hospital. † Accepted for entrance block and receiving and vagrants' wards.

LONDON.—For alterations to coach-builders' shop and front in Romford-road, Forest Gate, for Mr. W. Gallon. Mr. C. J. C. Pawley, architect, 66, Victoria-street, S.W.:—

Sabey & Son	£538 0 0!
Turtle & Appleton	530 0 0
A. B. Hill	429 13 0
J. Lawrence	396 15 0
F. Colwell	365 0 0
J. Garner	250 0 0!

LONDON.—For general alterations and shop fittings, for Messrs. Lockhart:—

King-street, Hammersmith.

Brittain	£400 0 0
G. M. Greenwell	323 0 0

Church-street, Kensington.

Bright & Co.	470 0 0
G. M. Greenwell	393 0 0
Brittain	365 0 0

Euston-road, King's Cross.

Bright & Co.	212 10 0
Brittain	165 0 0
G. M. Greenwell	159 10 0

LONDON.—For rebuilding the "White Hart," Cornwall-road, Stamford-street, S.E., for the New London Brewery Company. Mr. G. E. Niblett, architect and surveyor, Hackney:—

Gregory & Co.	£940 0 0
Burman & Son	930 0 0
W. & L. Ransom	910 0 0
W. E. B. Romain (accepted)	680 0 0

LONDON.—For alteration to "The Bell," Borough Market, for Mr. W. R. Bishop. Messrs. Eedle & Meyer, architects, 8, Railway-approach, London-bridge:—

Spencer & Co.	£580 0 0
A. Brett	498 0 0
Walker Bros.	436 0 0
J. Beale	398 0 0

LONDON.—For alterations, &c., at the Mile End Radical Club, 137, Globe-road, E.:—

Geo. Barker	£799 0 0
W. Nell	685 10 0
S. Lissner	675 0 0
Pitman & Son (accepted)	566 0 0

LONDON.—For alterations and additions to the "British Lion," Putney-bridge-road, for the New London Brewery Company. Mr. G. E. Niblett, architect and surveyor, Hackney:—

W. & L. Ransom	£521 0 0
Burman & Son	445 0 0
Gregory & Co.	427 0 0
W. E. B. Romain (accepted)	350 0 0

LONDON.—For alterations at the "Crown and Sceptre," Brompton-road, for Mrs. Hollyman. Mr. G. E. Niblett, architect and surveyor, Hackney:—

Burman & Son (accepted)	£1,007 0 0

LONDON.—For pulling down and rebuilding Chelsea Church House, Chelsea Old Church. Messrs. Mackmurdo & Horn, architects, 20, Fitzroy-street:—

A. Monk, Edmonton (accepted)	£1,052 0 0

MALDEN.—For alterations and additions at Motspur Park, for Mr. Charles Blake. Messrs. Edmeston & Gabriel, architects, 42, Old Broad-street, E.C.:—

Carmichael	£1,250 0 0
Smith & Son	1,187 0 0
Scott	1,180 0 0
Young & Lonsdale	1,093 0 0
Thorne (accepted)	964 14 0

PENZANCE.—For the erection and completion of a new Fire Brigade Station at Penzance. Mr. George H. Small, Borough Surveyor, Penzance:—

Messrs. A. Trythall & Jos. James, Penzance (accepted)	£182 9 0

PLYMOUTH.—For the erection of a new warehouse at the corner of East-street and Market-lane, Plymouth, for Messrs. Spooner & Co. Mr. W. Dunn, London, and Mr. W. N. Spooner, Plymouth, joint architects. Quantities supplied by Mr. John H. Dwelley, Plymouth:—

Berry	£4,284 0 0
A. E. Marshall	3,940 0 0
Shellabear	3,700 0 0
May	3,597 0 0
Lapthorne & Goad	3,575 0 0
Reed & Blight	3,462 0 0
Lethbridge & Son	3,455 0 0
Blowey	3,415 0 0
Roberts, Plymouth (accepted)	3,098 0 0

PORCHESTER.—For the erection of new stables, coach-house, &c., and additions and alterations to the "Cormorant" P. O. Mr. Wm. Yeardye, architect, Gosport. Quantities supplied:—

Fulliford's Trustee	£717 16 10
G. Stallard	648 0 0
J. Croad	609 0 0
C. Wareham	567 0 0
J. Plummer, Fareham (accepted)	550 0 0
J. Crockerell	550 0 0

ROWLANDS CASTLE (Hants).—For the erection of a residence, &c. Mr. Wm. Yeardye, architect, Gosport:—

F. G. White & Sons, Landport*	£800 0 0

* Accepted.

SHIREGREEN (near Sheffield).—For the construction of sewers at Shiregreen, near Sheffield, for the Wortley (Sheffield) Union Rural Sanitary Authority. Mr. Geo. E. Beaumont, surveyor, Grenoside, Sheffield:—

F. & T. Bool	£460 8 0
Robert Holmes	382 0 0
Dearden & Jackson, 46, Rutland-street, Sheffield (accepted)	313 14 0

SOUTHSEA.—For additions and repairs in Gloucester House, Victoria-road South, Southsea. Mr. Wm. Yeardye, architect, Gosport:—

J. Crockerell, Landport (accepted)	£140 0 0

STANNINGTON.—For the construction of an 18-in. earthenware pipe sewer, 245 yards in length, in Back-lane, Woodland View, Stannington, for the Wortley (Sheffield) Union Rural Sanitary Authority. Mr. Geo. E. Beaumont, engineer and surveyor, Grenoside, Sheffield:—

Dearden & Jackson, 46, Rutland-street, Sheffield (accepted)	£206 10 9

STROKESTOWN (Co. Roscommon).—For additions to waterworks at Strokestown, Co. Roscommon, for the Guardians of Strokestown Union. Mr. Chris. Mulvany, Engineer, Castlerea, Ireland:—

James Black	£661 0 0
Thomas Watt	644 13 6
John Wheelan, Strokestown*	610 10 2

* Accepted.

STUBBINGTON.—For the erection of new kitchen, scullery, &c., at Stubbington Lodge. Mr. Wm. Yeardye, architect, Gosport. Quantities supplied:—

E. Tutte	£863 10 0
C. Wareham	803 0 0
W. Jenkins	753 0 0
C. M. Dash	708 10 3
J. Plummer	700 0 0
T. P. Hall	678 0 0
J. Crockerell, Landport (accepted)	598 0 0

TOTTENHAM.—For new premises, High-road, Lower Tottenham, N., for Mrs. Thompson. Mr. Alfred Richards, architect, 8, New Broad-street, E.C. Quantities by Messrs. Gordon, Lowther, & Gunton, 16, Finsbury-circus, E.C.:—

M. A. Humphreys & Son	£1,540 0 0
J. Giles	1,535 0 0
Fairhead & Son, Enfield	1,379 0 0
H. Knight & Son	1,360 0 0
Porter	1,298 0 0
Jarvis	1,295 0 0

WESTBURY (Wilts).—For the erection of a residence at Leigh, Westbury, Wilts, for Mr. G. H. Knight. Messrs. Halliday & Anderson, architects, 16, High-street, Cardiff:—

W. Church	£3,967 0 0
J. Bladwell	3,795 0 0
Reed & Blight	3,578 0 0
P. J. Ponton	3,567 0 0
W. Bowers	3,490 0 0
G. Moore	3,487 0 0
H. Forse	3,425 0 0
W. Smith, Trowbridge (accepted)	3,357 0 0

WEST HEATH.—For the erection of Ward block at the Infectious Diseases Hospital, West Heath, King's Norton, near Birmingham, for the King's Norton Union Rural Sanitary Authority. Mr. Robert Godfrey, engineer and surveyor, Valentine-road, King's Heath, near Birmingham:—

Sapcote & Sons	£2,380 0 0
T. Surman & Sons	2,330 0 0
Mills & Sons	2,279 0 0
J. Bowen	2,227 0 0
C. Bryant	2,190 0 0
James Moffatt	2,185 0 0
J. Bishop	2,175 0 0
H. Lovatt	2,131 0 0
Currall & Lewis	2,117 0 0
John Webb	2,095 0 0
J. Barnsley & Sons, Birmingham*	1,996 0 0

* Accepted.

WOOLWICH.—For pulling down and rebuilding the "Royal Mortar" hotel, Woolwich, S.E. Mr. H. H. Church, architect. Quantities supplied:—

Martin, Wells, & Co.	£4,553 0 0
Multon & Wallis	3,993 0 0
Nightingale	3,920 0 0
Monday	3,867 0 0
Balaam Bros.	3,850 0 0
Chapman	3,693 0 0
H. L. Holloway	3,683 0 0
J. O. Richardson	3,537 0 0
Proctor	3,386 0 0

WOOLWICH.—For pulling down and rebuilding Nos. 82 and 83, Powis-street, Woolwich. Mr. H. H. Church, architect. Quantities supplied:—

	No. 82.	No. 83.
Wells	£1,200 0 0	£1,200 0 0
Monday	1,011 0 0	929 0 0
Nightingale	1,056 0 0	993 0 0
Chapman	959 0 0	989 0 0
J. O. Richardson	958 0 0	987 0 0
Holloway	893 0 0	963 0 0
Balaam Bros.	898 0 0	951 0 0
Multon & Wallis	866 0 0	899 0 0
Proctor	855 0 0	910 0 0

YAPTON (Sussex).—For erecting a pair of cottage residences at Yapton, Sussex, for Mr. W. A. Hounsom. Mr. E. J. Hamilton, architect, Brighton. No quantities provided:—

Bicknell & Pile, Littlehampton	£750 0 0
W. Pratt, Bognor	679 18 6
Snewin Bros., Littlehampton	635 0 0
Booker Bros., Bognor	615 0 0
A. E. Booker, Walberton	600 0 0
A. Burrell, Arundel (accepted)	592 0 0

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